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Aging in a Print Works

Introduction — Historical — Developments in Aging Machinery — Present-Day Agers — Classes of Colors Aged—The Ager as an Isolated System—Definitions and Terms—Conditions Within the Ager—Course of the Cloth in Aging—Troubles—Proper Study and Control of Ager—New Devices

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TO an observer unfamiliar with the inner workings and difficulties of aging, this rapid, continuous steaming process of printed goods for color development or discharge seems like a rather tame and simple operation. It is true that the colors on the cloth in passing in and out of the ager undergo a change in shade that looks somewhat miraculous, but there is nothing else that can be seen that would tend to excite the attention.

There is probably nothing in a print works, however, that has caused more distress and argument or has been less clearly understood than this process, which is so simple from a purely mechanical standpoint. The complexity of it lies in the invisible matter of the chemical reactions taking place on the cloth and the heat and moisture interchanges between it and the steam. The problem is to control these so that the greatest brightness, depth, fastness and uniformity of shade will result, with the greatest all-around economy of time, colors, chemicals and steam.

Since the agers are indispensable in any modern print works doing discharge or fast color printing, they must be operated fairly well or else these plants would have to stop producing goods. In places where the aging capacity is small, requiring much night work, any difficulty with these machines would certainly be very critical.

It would surely seem, however, in this operation, as in many others in the textile field, that there might be a large gap between operating well enough to get passable results and attaining the maximum efficiency.

There are probably may private concerns which have given this problem considerable thought and study, with some fruitful results; but judging from the literature, which is small in comparison with the importance of the subject, it has not been given the exhaustive, scientific research that it deserves and which would undoubtedly pay in practical benefits. The literature has not given a clear enough analysis of the situation and has failed to tie up sufficiently the factors into a connected relationship. This, and the great variation of conditions in different plants, from the making of the color to the actual state of things inside the ager, largely accounts for the confusion that exists.

While the subject has always been a live one for discussion, it has lately come to the fore more than ever on account of the great increase in vat color printing and because of certain improvements in aging that have come to light.

To cover the whole thing thoroughly would involve not only a study of the operation itself in regard to the different color reactions and the several fibers, including cotton, silk, wool and the different types of rayon, but would require going into the various color recipes, the drying of the printed cloth, and its natural or artificial conditioning before aging. All these things should be thoroughly considered; but there are available insufficient practical data, and it would be too long for a general article like this. Attention will therefore be confined more to vat colors on the cotton fiber and to what actually goes on in the ager, with the object of making clearer the underlying principles.

Historical

It would be interesting and helpful to a clearer understanding to consider somewhat briefly the history of aging. Hannay,[1] from whose lecture much of the following has been abstracted, has given a very full and clear description of this historical development.

The earliest records of steaming as a process for the fixation of colors indicate the date of discovery to be about 1790. It was first employed as a means of fix-

ing colors on wool and was treated with great secrecy. The colors employed were the vegetable mordant colors, such as Quercitron Bark and Madder.

The dyed style—i. e., printing on mordants, aging, fixing and dyeing—gave so much faster results on cotton than that obtained by the steaming process that steaming was not so much used at that time.

The first anywhere near practical means for steaming was a primitive affair called a "deal chest," which was a box with an opening at the top for the cloth to go in and provided with openings at the bottom to allow steam to come in from a boiling-water bath over which it was placed. The next steaming arrangement which appeared consisted of a sunken box 8 or 9 feet deep, open only at the top, the steam being brought from the boiler by a pipe entering at the bottom. The goods to be steamed were hung on rails in the upper part of the box, properly protected from water drops, a cover put on and the steam admitted. This was followed by the "cottage steamer," which was a wooden box with the opening for the cloth at the end, and was provided with a sloping roof, from which it derives its name, to allow the condensed steam to run down the sides instead of dripping on the goods. Iron gradually replaced wood, and improvements were made in holding the cloth, finally resulting in the present-day pressure steamer, usually cylindrical in shape, in which the goods are looped on poles and exposed to the action of the steam at various pressures.

This intermittent process was gradually superseded as a regular steaming method by a series of improvements, with the object of making it continuous. This effort was stimulated by the general displacement of block printing by the roller printing machine and by the discovery of Mauve by Perkin in 1856, followed by the rapid development of the coal-tar industry.

The most important of these improvements was that of Cordillot and Mather in 1875. This was a chamber with a steam-heated roof, immediately under which the cloth passed horizontally over a series of rollers. In the lower part were four wagons to receive the goods, arranged so that there was always one being heated while one was being filled.

In this same year J. Smith, of Thornliebank, took out his first patent for a continuous steamer which covers all the essentials of the modern machine. Several other patents by Smith and by Mather and Platt followed this, leading up to the present generally used steamer through which the cloth passes in several strands on poles. These poles are returned in various ways to the front of the machine to again receive the cloth. Live steam is introduced at the bottom from perforated pipes. Closed steam coils are also in place at the bottom in order to slightly superheat the steam, and steam chests are at the top to prevent condensation. The pressure is atmospheric, and there is ample chance for air, whether beneficial or not, to enter in with the cloth.

The literature indicates that aging or short steaming was developed about simultaneously with that of the above-described long steamers. The term *aging* was originally applied to the operation of heating the mordants printed on the cloth preparatory to the subsequent dyeing. In the early days, as mentioned before, most of the goods were printed with thickened mordants only. At first it was thought sufficient to hang the cloth in hot air, but it became clear after a while, largely by the efforts of Daniel Koechlin, that moisture as well as heat was necessary. Rooms were built over streams of water, and also moisture was artificially introduced to gain that end. They finally not only controlled the temperature and fixed the time of contact of the goods with the moist air, but regulated this moisture by means of a wet-bulb thermometer in conjunction with the dry-bulb thermometer already in place.

Machine for Aging Mordants

In 1849 John Thom, of the Mayfield Print Works, patented a machine for aging mordants by passing the cloth through a wooden box over rollers, this box containing aqueous vapor evolved from a surface of water heated to 180 deg. F. This was the first rapid ager. It held 36 yards of cloth and the time of contact was about 90 seconds, which was found to be insufficient.

This ager was followed by that of Walter Crum, of Thornliebank. This was a large chamber in which the cloth was in contact with the moist air for fifteen minutes at a temperature of 80 to 100 deg. Fahr. Even this was found to be too short a time.

In 1863 the process of producing Aniline Black on cotton was patented by Lightfoot. He originally used the existing aging rooms, but the ever-increasing importance of this color led to further improvements, the most notable of which was that patented by Thom in 1874.

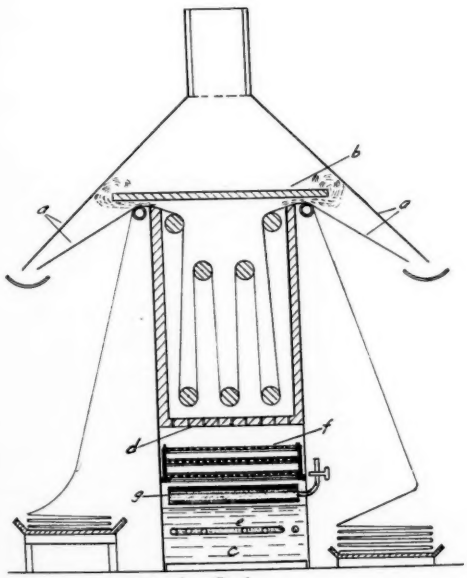
This ager practically covers every point of the modern Aniline Black machine. There were steam chests at the top to prevent water drops. The cloth entered and left it by the same aperture passing over rollers at the top and lower part. Live steam was introduced at the bottom from two pipes. For a long time this machine was used almost exclusively for Aniline Black, but with the introduction of direct cotton dyes dischargeable with stannous chloride and the increased popularity of the Prudhomme method for reserves under Aniline Black, which will be described farther on, the short ager grew immensely in importance, leading to other betterments and inventions.

The next important step in printing and aging processes was the method and machine of Schlieper and Baum for the development of Indigo by printing alkaline Indigo paste on glucose-prepared cloth, followed by a short steaming. This ager, shown diagrammati-

cally in Fig. 1, strongly resembled Thom's original ager of 1849. It was a wooden affair, the cloth entering from one side, passing up and down several times over rollers and out again from the opposite side. Live steam was supplied from a reservoir covered with three perforated plates, with holes staggered to prevent splashing. The time of passage was thirty to seventy-five seconds, and it was recognized by the inventors that it was necessary to exclude air and to have a copious supply of saturated steam.

Dr. Karl Reinking,[2] one of the Badische Company's experts, who did much to make clearer the whole process of aging, gave great credit to Adolph Schlieper in stating that Schlieper's published writings were all that were necessary to design a successful ager to-day. The above machine certainly seems, in principle at least, if not in appearance, to be the prototype of the present-day vat ager.

In 1900 Kalle & Co. introduced a process for fixing printed Indigo without the use of reducing agents by means of superheated steam in an air-free ager. Following this, in 1900 and 1901, stable hydrosulphites, including our present Rongalite, were introduced, which were of the greatest value to the trade. Thioindigo Red was discovered the same year by Friedlander. This was followed soon after by the Chlor and Brom Indigos, and finally by a whole series of new vat dyes. For one reason or another these new colors did not work out very well in the Schlieper and Baum ager; due, it is thought by some, to the unsuitability of the recipes used and to the time factor. This led to the design of what was called the "hydrosulphite ager." Somehow, due perhaps to a consideration of the Kalle process and to the high temperatures necessary to discharge some dyestuffs, such as Para Red and Naphthylamine Claret, it was thought necessary to employ superheated steam. This led to several unsuccessful designs.



a Wooden Roof
b Heated Copper Plate
c Water Tank
d Perforated Wooden Bottom
e Steam Pipe under Water
f Brass Sleeves
g Steam Pipe above Water

Fig. 1. Cross Section of Schlieper and Baum Ager for the Development of Indigo (after Dépierre

FIG. 1

It was along about the time of the war that this error commenced to be realized. Through the work of Reinking and others, especially after the interruption in exchange of information and regular trade activities caused by the war, the nature of the reactions in an ager became better known. Agers were then changed in design, supplying saturated steam rather than superheated steam to the machine and working in general more harmony with Schlieper's principles.

PRESENT-DAY AGERS

In regard to our modern machines, for those who are not familiar with their construction and in order to visualize the subject better, what might be considered as a typical modern ager will be described. In Fig. 2 is shown one of the latest Mather and Platt machines.

There are two types of agers in general use to-day which are very nearly the same. One is the air-free vat ager and the other is the short Aniline Black machine.

Both are large iron boxes into which the cloth passes, printed side downward, through an aperture and then up and down from lower to upper rollers until it reaches the end of the box, and then back above the rollers, printed side up, through the same aperture as the entering cloth, then through a plaiter into a truck on the floor. Agers are generally arranged to carry two strands of cloth at the same time.

Live steam is usually introduced into the bottom of the ager through perforated pipes, is deflected upward by the bottom of the ager, through the cloth and around its sides, out through the aperture and then through what is called a "bonnet" by means of an exhaust fan. These agers are all heavily insulated and provided with steam-heated top plates to prevent condensation and water drops. Other steam coils are sometimes present to assist in supplying heat and to prevent condensation.

Practice varies in different plants on the kind of steam used and how introduced, and that will be taken up more later.

Probably a good average size vat ager would be 5 x 10 x 25 feet, holding about 180 to 200 yards of cloth. The usual time of aging is about four to six minutes and the speed 30 to 35 yards per minute.

Aniline Black machines are considerably shorter,

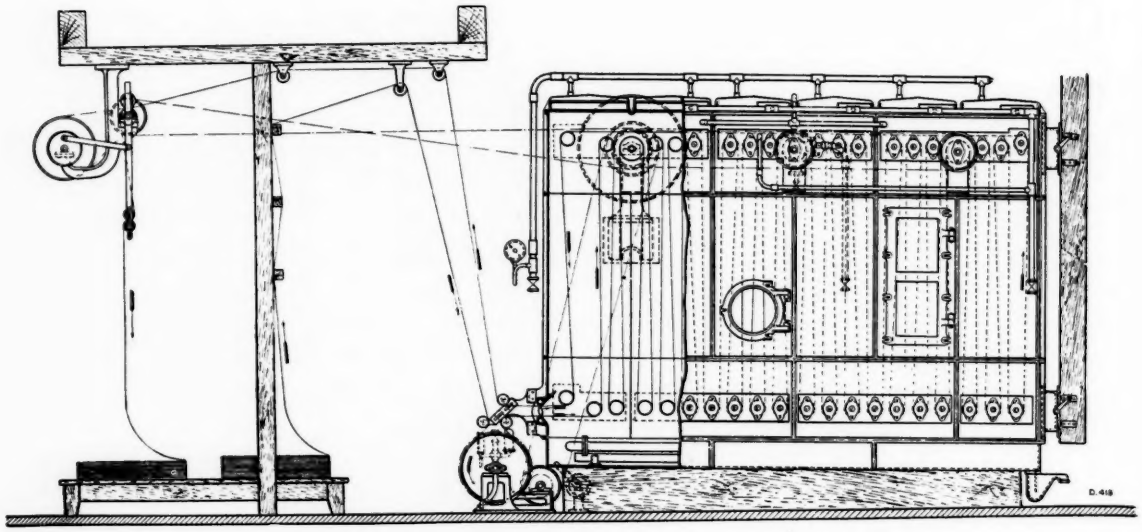


FIG. 2

Hydrosulphite and Aniline Aging Machine with Draw Rolls, Driven by Cone Pulley and Belt.
(Courtesy of Mather & Platt, through Leigh & Butler, American agents.)

the aging time is one to two minutes and the speed about 60 yards per minute.

CLASSES OR COLORS AGED

The colors and reactions handled in agers to-day can be reduced, it is believed, to seven classes, which are as follows:

1. Vat colors put on with Rongalite.
2. Vat colors in the form of Indigosols.
3. White and colored discharges with Rongalite.
4. Oxidation reactions, of which Aniline Black is typical and most common.
5. Oxidation discharges, white and colored, with chlorate and other oxidizing agents.
6. Rapid fast colors.
7. White and colored resists under Aniline Black.

Each and every one of the above color reactions requires for the best results with any given printing recipe a specific aging condition. Also, where there are two or more colors in each class there usually will be enough difference between them to require some modification both in printing recipe and aging condition, even within the group, for the best results. It obviously would be an almost interminable piece of work to write all these specific requirements even if, with our limited practical data and imperfect means of measurement, such specifications could be determined.

In the color shop, however, certain average or general formulae have to be developed to avoid an unwieldy number of recipes and standard printing pastes, especially within each color class where several colors are mixed together and are not printed separately. Likewise, in the ager the conditions must be similarly standardized, and even more so since not only may there be colors from the same class but there may be several classes printed and necessarily aged at the same time; for instance, vats, Aniline Black, rapid fast colors, and white or colored Rongalite discharges.

In spite of this necessary standardization however, it is conducive to the highest understanding of the subject to inquire thoroughly into the chemistry and printing recipes of each of the above reactions and to seek, theoretically and in practice, the specific aging conditions for each one. To further this end somewhat, as well as can be done in this article, each of the above classes will be very briefly taken up.

1. *Vat Colors Put on with Rongalite.*—These colors are usually incorporated in a converted starch or British gum paste, together with sodium or potassium carbonate, Rongalite (sodium sulphoxylate formaldehyde) and glycerine. In the aging the dyestuff is reduced by the Rongalite to its leuco compound, which is converted into a soluble salt by the alkali. The usual aging time is four to six minutes with air-free steam at temperatures recommended by the dyestuff dealers of from 212 to 216° F. After aging, the colors are developed by oxidation in a warm solution of bichromate and sulphuric acid, rinsed and well soaped.

2. *Vat Colors in the Form of Indigosols.*—These are sulphuric acid esters of vat colors in the reduced, leuco state. They are usually incorporated in starch-gum tragacanth mixtures, together with sodium chlorate, to act as an oxidizing agent, and some salt, such as ammonium sulphocyanate, which will have an acid reaction by hydrolysis in steaming. There is also employed a catalyst, usually ammonium vanadate, to promote the oxidation. The usual aging conditions are about the same as for vat colors, except that the possibility of air contamination is not such a factor, possibly the air being beneficial rather than detrimental.

3. *White and Colored Discharges with Rongalite.*—

The white discharge paste is usually gum tragacanth or British gum containing the requisite amount of Rongalite to discharge or "cut" the ground color. Very often a small amount of anthraquinone paste is put in which acts catalytically to speed up the reaction.

Colored discharges, besides the Rongalite necessary to cut the ground color, may contain the regular vat dyes. In these the vat printing paste itself, generally without extra Rongalite, is employed directly, there usually being sufficient Rongalite to reduce the vat color and to cut the ground at the same time. Basic colors with tannin present to form an insoluble lake are also employed, and also pigment colors with blood albumen to fix them by coagulation. There are a few acid and chrome colors that will stand the action of the Rongalite which are used, the acid colors as such being confined to animal fibers.

Besides the comparatively easily discharged grounds such as the direct and diazotized and developed colors, Indigo and other vat colors, principally of the indigoid type, and sulphur colors are also employed. The discharge effects generally obtained in these last cases are whites. In these discharges a substance called Leucotrope W, which is the calcium disulphonate of di-methyl phenyl benzyl ammonium chloride, is used with the Rongalite to form an alkali soluble compound with the leuco vat color, which is washed out after aging. Yellow discharges are obtained with tse unsulphonated compound, or Leucotrope O, wren used on Indigo, as the product formed with this and the reduced Indigo is a yellow, alkali insoluble compound which remains in the goods after washing.

The temperatures used for discharge with Rongalite are generally from 218 to 220° F.; the time is the same as for vats and the steam is kept air-free.

4. In Aniline Black there is the printing paste, usually made up of starch and tragacanth, a soluble salt of aniline, an oxidizing agent and an oxygen carrier or catalyst, which always consists of a salt of some metal capable of existing in two states of oxidation. The soluble aniline salt generally used is aniline hydrochloride, the oxidizing agent is sodium chlorate, and the carrier commonly used is sodium ferrocyanide.

By the steaming, which, as mentioned before, is a short one of one or two minutes at a temperature close to 212° F., the aniline is oxidized into an intermediate product called Emeraldine. By the subsequent development through hot bichromate it is converted to Nigraniline and finally to Ungreenable Black.

Amido Black Base 1 (para-amido diphenylamine) and Paramine Brown (para-phenylenediamine) are products printed and oxidized in a similar manner using other oxygen carriers. The Amido Black is used chiefly for Celanese. It requires a longer aging than Aniline Black, around four or five minutes at the usual aging temperatures, or it can even be steamed in the continuous steamer. The after-chroming of this color is omitted.

5. *Oxidation Discharges.*—These are typified by the chlorate discharge for Indigo, sulphur and basic colors. The oxidizing agent, sodium chlorate, is accompanied by an oxygen carrier, usually sodium ferricyanide, and either an acid, such as citric acid, or a salt, which will develop an acid on steaming, such as ammonium citrate. The thickening used is generally British gum.

These discharges are used chiefly for whites; but by adding pigment colors that will withstand the action of the oxidizing agent, such as lead chromate, and blood albumen as a binder, a colored effect can be obtained.

The aging time is from one to three minutes, generally a little longer than for Aniline Black, with steam at around 212° F. As with Aniline Black, the presence of air is not thought to be hurtful, but instead is probably beneficial.

After aging, the goods are washed with warm water and then pased through a slightly alkaline bath, unless there is a pigment present, in which case the cloth is washed and lightly soaped. Other oxidizing agents and carriers may be used, especially for Indigo.

6. *Rapid Fast Colors.*—These colors are made up of mixtures of the nitroso compounds of the bases, such as Fast Red G Base (3-nitro-4-amino toluene) and the sodium salts of the Naphthol AS series, which are mostly derivatives of beta-oxy-naphthoic acid. These are made up in a paste, which is slightly alkaline, with starch tragacanth mixtures as the thickening, together with Turkey Red oil, which serves as a protective colloid and penetrating agent. There is also generally added some neutral chromate, which serves as an oxidizing protective agent against the action of steaming.

In the course of the aging and the subsequent passing through, hot, weak acid reactions equivalent to a coupling of a diazo body and a phenol take place, with full development of the azo color within the fiber as the final result.

The aging conditions recommended are from two to three minutes at around 212° F. In this case, also, the presence of some air is not considered a detriment.

7. *White and Colored Resists Under Aniline Black.*—The resists most commonly used are whites, vats and basic colors, comprising the several forms of the Prudhomme method. Other colors, such as the naphthol colors, can also be used for colored effects under Aniline Black.

In these resist processes the Aniline Black can be padded on first and lightly dried so as not to develop the black, and then the resists or reserves printed on, followed by aging. In this case the reserve can be considered as a partial discharge. The reserve, also, can be put on first and later run through the Aniline Black, followed by aging. In this latter case with vat colors they are usually aged before padding in order

to prevent bleeding of the print color, as well as to obtain a better development of it.

With vat colors, besides the mechanical resisting action of the thickening there is the chemical resisting action of the Rongalite and the alkali, while in white and basic color resists such materials as sodium bisulphite and acetate have to be added. Zinc oxide is another product generally added for mechanical and chemical reasons.

In the aging there is the development of the printed color as well as the resisting reactions, and the whole thing is somewhat similar to what is taking place in a regular white or colored discharge. The conditions usually employed for the resist part of the process are a short steaming of one to two minutes at around 212° F. in an Aniline Black ager in which air may be present, and, again, the detrimental or beneficial effect of this air is problematical.

After the aging the goods are washed in various ways to remove the excess thickening, to clear the whites, and to develop and brighten the print colors.

Most of these reactions are carried out on cotton, but animal fibers such as wool and silk may be used in cases 1, 2 and 3. In the cases of 1 and 3 the alkali and reducing agent must be kept as low as possible in strength to prevent tendering of the fiber.

The Ager as an Isolated System

Looking at the aging box from the outside, or as a system involving an input and output of energy and materials, there is, first and foremost, cloth entering in, carrying colors, various chemicals and moisture, and probably carrying a certain amount of air. Next, there is live steam entering directly into the ager and into the closed plates and coils.

Coming out, there is, again, the cloth with the modified, fixed or partially fixed colors, and, second, the condensed steam from the plates and coils. Lastly, there are the exhaust gases containing the impurities given off by the reaction from the cloth.

A Few Definitions and Terms

In the ager, there is taking place on the cloth one or more chemical reactions which require both heat and moisture on the cloth to perform them successfully. These reactions can and must be controlled within certain limits to avoid trouble and to get the best results. In order to study them a few terms in use in the trade and literature should be made clearer.

For the sake of those who are not so familiar with the chemical side the following brief review will be given. In most chemical reactions there is a pronounced heat effect, positive or negative, of lesser or greater magnitude. When this is positive, or when heat is evolved, it is called an exothermic reaction; and when negative, as is the case when heat has to be supplied, it is called an endothermic reaction. Most reactions taking place in an ager are exothermic, and strongly so.

A chemical reaction takes place also with a certain speed, which is a function of the concentrations of the reacting chemicals, the temperature, the presence of certain positive or negative bodies, called catalysts, that either promote or retard a reaction, and the kind and extent of the surface upon which these substances are interacting. In certain ideal cases the speed of these reactions can be calculated, but in most cases it is a complicated matter and can only be determined by trial.

Coming now to the matter of steam, the terms "dry saturated," "moist" and "superheated steam" are often heard. Real dry, saturated steam is a rarity usually only obtainable by the greatest of care in physical or engineering laboratories where the properties of steam are being studied. If water is allowed to evaporate into a vacuous space it will be recalled that there is a strict relationship of the pressure of the water vapor to the temperature of the water. The temperatures and pressures are often plotted as a curve or are given in tabular form in the various steam tables. This vapor, if entirely free from any suspended droplets of water, is called dry, saturated steam, and if this vapor is strictly in this state or if heated beyond this point, it is invisible and is not the mist or fog generally recognized as steam when it escapes into the atmosphere.

If this gas is led off from the water from which it is generated and either cooled slightly, keeping the pressure constant, or compressed slightly, keeping the temperature constant, there will be a condensation of steam into water, and it will not be dry, saturated steam but steam containing more or less water in suspension in large or small droplets or as a mist. This latter is called wet, saturated steam or just moist steam, and this water content can vary between wide limits. The "quality" of the steam is known as the percentage of dry, saturated steam in a given weight of it, or 100 minus the percentage of moisture.

If this saturated steam, dry or moist, is heated sufficiently at constant pressure or its pressure is allowed to drop at constant temperature, superheated steam is obtained, and the increase of this temperature over that corresponding to saturated steam at the given pressure is called "the superheat." If this process of heating or expansion is reversed, saturated steam, dry or wet, can be regenerated.

The process of generating steam is usually visualized as taking place in two distinct stages: first, the heating of water from an arbitrary datum temperature of 32° F. to the temperature corresponding to the pressure of the steam, and, second, its vaporization at this temperature. In the latter stage it will be recalled that a very large amount of energy is absorbed. The heat corresponding to this energy is called "latent

(*Continued on page* 508)

How Much Should a Dyer Know About Wool?

Conditions Have Changed in the Wool Dyehouse—Clean Wool Once the Important Factor—Educating the Small Rancher Will Help—Difficulty of Gauging Wool—Determining Temperatures and Strengths of Scouring Baths—Burning of Fibers During Carbonizing—Wool Changed by Chemical Processes—Chlorinated Wool

By GEORGE RICE

HOW much should a dyer of modern colors on wool know about wool in order to dye it economically and efficiently is a question which one frequently hears in dyehouses. When colors were fewer and often so well standardized that satisfactory and durable shades could be obtained on almost any kind of good woolen stock, regardless of its cleanliness and general physical and chemical condition, it was hardly necessary for a dyer to be a wool expert to get results. It was possible to dye fast blacks, blues, greens, reds, yellows, grays and browns on wool even if the wool were not as soft, white, fluffy and as fine as desired. If the wool happened to be a little weak and mushy in staple, due to excessive sun exposure on the backs of the sheep, or contained a residue of animal grease due to poor scouring, or was kempy or smeared here and there with a paint or tar mark, the dyer usually managed to color it evenly in the loose stock, the slubbing, the yarn or the piece.

But conditions have changed in all dyehouses. Colorists are constantly introducing new hues and tints which are suggested by the shadings of landscapes, the plumage of birds, the colors of the flowers and the rainbow. Many of the new colors are given a commercial name which does not describe what they look like, and consequently the meaning has to be given. One dyer received an order for a batch of wool to be colored fumed oak. In brackets were the descriptive words "nut brown." Orders often are received to dye the stock atmosphere, sunlight, cuckoo tan, cupid pink, Venus, September morn, crushed peach and similar modish colors.

The dyeing of these delicate and sometimes mystifying colors frequently tests the ability and experience of our best dyers. If the production of these new colors depended chiefly upon the efficiency of the dyestuffs and chemicals, and upon the methods of applying them and the skill of the dyer to get bright and fast shades, the problem would not be quite so difficult to solve. But many of the colors depend almost as much on the trueness of the fiber, softness of handle, purity of color, soundness of staple and general features of the wool as they do upon efficiency of the dyes and the methods of applying them.

This is the reason that a dyer of the present time must know more about the characteristics of wool than formerly. We used to draw a few fibers of wool through the fingers to see if they varied in diameter from root to tip. Even if they were found to be wasted away in the middle to some extent, due to disease or a drought during the growing period, it was easy to dye them one of the good old solid colors. While in a dyehouse the other day I was shown an expensive, high-powered magnifying instrument used solely by the dyer in determining the trueness of merino wools, their crimps per inch, their straightness of fiber, regularity in length, and physical appearance. Any lot of wool not coming up to the specifications in these respects is dyed for the normal line of fabrics, whereas the wool that met with the requirements for the pale and delicate shades is dyed for these special fabrics.

Clean Wool Was the Important Factor with the Old Colors

If a dyer received the wool in a clean condition he was fairly sure of getting a good color on it when shades were limited in number and more or less stabilized. But with a thousand or more colors in vogue and new ones coming in all the time, something more than clean wool is needed to enable him to give satisfaction. He may receive the wool in the grease and clean it in his own department and under his own jurisdiction. Or he may receive it in a fleece-scoured or half-scoured state. Or it may be skin wool from the lime vats of the tannery. He can get it clean. He knows how. Wool scouring is a part of the dyeing trade, even though it may be conducted in another room under a scour boss in some mills. But it is a question of how much the dyer knows about the wool itself that appears to concern many at present. Wool cleansed of all impurities was essential in the dyeing of the old colors, but simply all clean wool will not be sufficient for many of the new colors.

The Wool Itself Must Be Right

It is not fair to expect a dyer to be a wool expert. A man cannot classify wool expertly even after six

months' training alongside an expert wool sorter. I had precisely six months' education in wool sorting in a mill and at the end of the six months was unable to sort a merino fleece correctly. But a dyer can pick up a great deal about the qualities of wool in his daily work, especially if he has to dye fashionable colors and has an energetic superintendent over him to require an explanation as to why certain colors failed to meet with conditions. He can get considerable valuable information about wool from articles in the trade press. An education in wool classing in a textile school is exceedingly valuable. I have known dyers to take advantage of the wool-sorting instruction in these schools.

Other dyers have spent their annual vacations on sheep ranches to learn more about wool instead of going fishing or to the summer resorts for pleasure. But the initial process of classifying the wool according to its length, soundness, elasticity, evenness, fineness, softness and strength is usually accomplished at the mill in a manner similar to that shown in Fig. 1. Variations occur with different breeds of sheep, or when the animal reaches an advanced age or when it has not received proper care on the ranch. A good deal of stiff, hard and sometimes broken wool is obtained from aged sheep, and this wool lacks a normal affinity for dye. The brittle, shiny, white and usually unsound dead fibers (kemps), that never take the dye well, are due to lack of scientific breeding and attention to the growing animals. These fibers are not really dead, but they are so-called because of their apparently lifeless conditions so far as absorbing and retaining color is concerned. Their kempy formation makes them a serious detriment to the appearance of any goods in which they appear.

Educating the Small Rancher Will Help

The modern dyer is not only getting an ever-increasing number of colors to produce, but in many mills the fleecy growths of other wool-, fur- and hair-bearing animals are used. There are a number of angora-wool rabbit ranges getting under way in the West from which some very good woolly products are obtained and sent to the mills to mix with sheep's wool. The product of the angora goat, the alpaca, the common goat, the cow, the horse and the dog may be used in some fabrics. As they are all animal fibers, their affinity for the wool dyes is about the same as for sheep's wool.

If it were possible to get the small growers of sheep, goats, rabbits and other wool-bearing animals to eliminate some of the faults that cause trouble in dyeing light and delicate colors, many of the dyehouse problems would cease. The writer recently visited a number of Western ranches and noted that, while the large growers used care in shearing the clip and preparing it for market, many of the small growers were careless. One small grower can spoil a lot of wool from a large grower when a local buyer mixes the two lots for an Eastern shipment. For instance, at one shipping point I saw a carload of fine merino wool spoiled by the local buyer adding small and inferior clips to it which he had purchased from a number of small growers, some of whom had been very careless in the care of the sheep and in the shearing. Matted and soiled locks, dags, tar ends and similar low-grade stock were dumped in with the good wool.

The large grower specializes in sheep growing, and usually the product is in good condition for dyeing when it is properly scoured. The small grower specializes mostly in farming, and it cannot be expected that his wool will be prepared for the market in an efficient manner. On one of these small farms the hired man told me that the boss gave orders to mark his few sheep plainly so that none of them would get lost in the neighbor's herd. The branding was going on at the time. The man laughed ironically and said, "You dye fellers will have some fun getting this tar out of this animal's hair." He said this because when I saw the pail of tar I suggested that it be applied lightly owing to the difficulty in removing it preliminary to dyeing.

The fact that this man considered it a good joke on the dyers to smear the tar on good and thick suggests the need of educating the small growers to the fact that heavy daubs of tar and paint on wool are serious propositions to dyers when it comes to removing these marks for efficient dyeing of modern colors. Even on some of the large ranches I saw open drums of paint, the exposure to the air resulting in a thickening of the paint, so that when applied it was put on unnecessarily heavy. I also noticed that on some of the large ranches the sheep were driven into dusty paddocks for shearing, so that in a few minutes clouds of dust were stirred up by the many feet and the dust

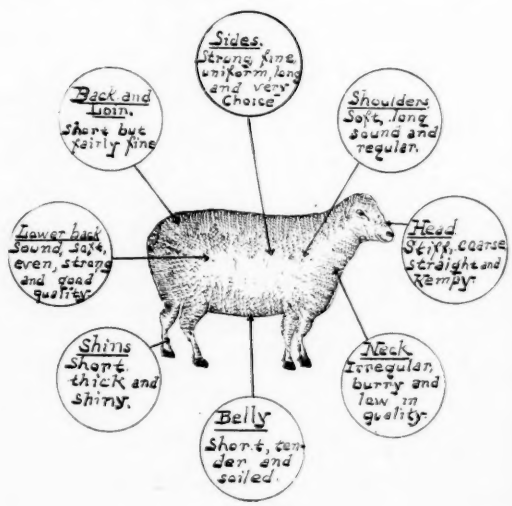
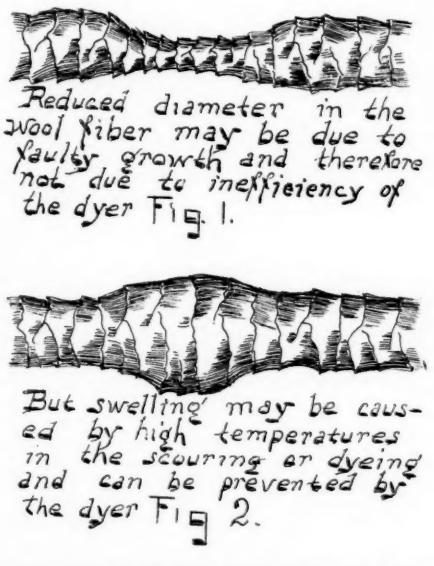


Fig. 1

particles settled in the wool. Animals that had been running on grass and were fairly white before entering the paddocks were well browned with dust when sheared, and the dust went along with the wool. Some dyer had to wash that dust out of the fiber after particles of it became fixed in the animal greases. Some


Reduced diameter in the wool fiber may be due to faulty growth and therefore not due to inefficiency of the dyer Fig. 1.
But swelling may be caused by high temperatures in the scouring or dyeing and can be prevented by the dyer Fig 2.
Sometimes fatty acids form during the carbonizing process and become burned into the fiber. Fig 3

Cut A

ranches have regular shearing sheds with board or cement floors, and all dust is avoided.

Experienced Dyers Occasionally Gauge Wool Wrong

To gauge wool wrong according to its fineness, elasticity, trueness, soundness, purity of color and general dyeing qualities is not an uncommon incident in the best regulated dyehouses. The most experienced dyers occasionally err in this respect. A dyer can judge fairly accurately the quality of the wool he has to dye by its soft, silky handle as compared with an unkind or harsh handle, and by its density or looseness of growth, strength or weakness of staple, or luster or dulness. But when it comes to judging the degree of purity of the wool and fixing on temperatures and scouring ingredients and processes for getting the wool clean, some of our best men frequently miss. That is, in an effort to get a batch of wool clean which appears to be not excessively impregnated with the naturally greasy, unctuous matter caused by the perspiration of the skin of the sheep and animal secretions, too little alkali or too low temperature is used in the scouring and the wool does not dye well because of the heavy, pasty and sticky condition in which it leaves the washing machine.

All dyers know that the most wool contains about a third of its weight in this suint or yolk and about a third of its weight in earthy substances, fatty matters and various substances fixed by grease, leaving only about one-third of the batch in clean wool. But the precise percentages of the various impurities are not always accurately determined and the wool sometimes gets underscoured and sometimes overscoured.

Efficient scouring means the removal of the natural animal greases and the earthy and extraneous matters without injury to the wool. A dyer must know wool in order to make sure that things are being done right in the preliminary stages of dyeing. Even if well cleaned, the wool will not dye well if it has been yellowed during the scouring. A scour boss proudly showed us some fine merino wool which was open and lofty because of the attention he had given it during the scouring, but it was impaired for even dyeing except for very dark colors because of its yellow color. He was using too high temperatures and too much alkali in cleaning the wool, and the dyer got the blame for not getting good colors on the goods.

In another mill they were getting a good velvet-like feel on the wool and also making it quite snow-white. But the animal greases and earthy substances had not been thoroughly removed, and these resisted the action of the mordants, causing streaky dyeing because the dye could not evenly penetrate the fiber and, instead remained on the surface, as was easily demonstrated with a glass carried by the writer.

Knowing the Wool Helps Determine Temperatures and Strengths of Scouring Ingredients

In a certain mill the technical supervising force of the office felt sure that various faults in the mechanical construction of some meltons was due to incompetent dyeing. It appeared to be that way, because the microscoped yarns which presented difficulties in spinning revealed fibers that were reduced in diameter at intervals, as shown in Cut A (Fig. 1), and other fibers increased in diameter at intervals, as shown in Fig. 2.

It was also apparent that these fibers did not mill well, for the finished goods lacked the firmness of structure that they should have had with the kind of wool used in the yarns. The boss dyer in this mill was also in charge of the wool scouring. The investigation placed the blame for the first lot of fibers, represented in Cut A, Fig. 1, on the wool buyer for the mill, for having purchased wool grown by poor and neglected sheep or by

sick sheep. The wool keeps on growing on the animal, but lack of proper food or illness prevents the fiber from filling out to normal size during the time, and its dimensions decrease at that point. This defect was not the fault of the dyer except to the extent that he ought to have discovered it and used this wool in goods in which it might get by to better advantage than in meltons.

The swelled fibers, however, were rightly blamed on the dyer because it was his orders that too high temperatures were used in washing the wool. The wool was unusually dirty and greasy and apparently abnormally tender, for it got puffy at close intervals in many of the fibers as shown in Cut A, Fig. 2. A healthy fiber will easily stand 100° to 120° F. in a scour liquor without injury. But in the case mentioned the dyer had given instructions for a high temperature with plenty of alkali and the man at the washing machine acknowledged utilizing both liberally. Evidently he had the liquor heated to 150° F. or higher a good part of the time.

Fatty Acids Decomposed and Burned During Carbonizing Cause Dyeing Troubles

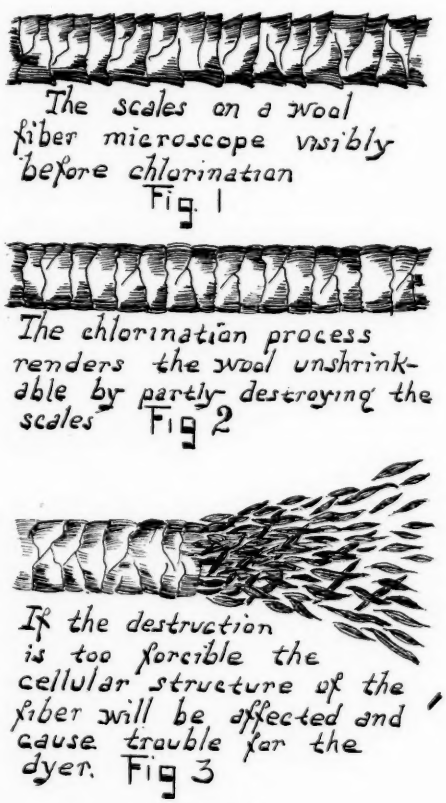
If the wool is burry it must go to the carbonizing process after scouring. The process is intended to remove all impurities of an organic nature, consisting mainly of the vegetable substances which caught in the fleece as the sheep roamed over the ranges. It is not supposed to remove greasy and soapy substances which remain adhering to poorly washed or improperly rinsed wool. A dyer was having trouble with some woolens which did not dye well because of the presence of burned places on the fibers. We were unable to procure any of the fibers that had been "burnt into" from these particular goods, but we show in Cut A, Fig. 3, a fiber similarly affected. The burned spot is indicated by the black. The spot in its natural state usually is brown, although sometimes it appears to be but little darker than the rest of the fiber. But this spot will not take the dye like the rest of the fiber, and when a number of the spots come together a visible off-color place is produced which hangs on through all of the finishing processes.

The burned place in the specimen is the product of greasy and soapy matter in badly scoured wool which had been affected by the action of a chloride that was used. The carbonization process decomposed the combination and simply burned it into the fiber. This illustrates the importance of having the wool thoroughly washed and rinsed to get the soaps or other scouring ingredients out of it before carbonizing it, thereby avoiding the danger that the sulphuric acid might liberate fatty acids or other substances which could form and become burned on to or into the fiber.

Wool Changed by Chemical Processes Often Presents Dyeing Problems

There are reasons why a dyer should know the dyeing possibilities of wool in its natural state and its dyeing possibilities when its original condition has been altered by chemical or mechanical means for specific reasons. We know that competent dyers have been disappointed and sometimes puzzled because they have failed to get a suitable color on wool in a loose state or in the piece after the fiber has been rendered unshrinkable so that it will not felt under the influence of hot soap, water and pressure.

There has been considerable interest taken in chlorinating wool lately owing to the adaptability of wool which has been thus treated for knit goods and other fabrics in which felting is not desirable. The interlocking of the rims of the epithelial scales of the wool fiber is, of course, the medium by which adjacent fibers unite and cause the mass to become more compact. The heat,


The scales on a wool fiber microscope visibly before chlorination
Fig. 1
The chlorination process renders the wool unshrinkable by partly destroying the scales Fig 2
If the destruction is too forcible the cellular structure of the fiber will be affected and cause trouble for the dyer. Fig 3

Cut B

moisture and pressure of a scouring or a fulling process also tend to swell the fibers and make them more plastic so that they pack closer and make a firmer structure. Consequently wool changes somewhat in its natural features when felted or when subjected to a process to prevent its felting. A wool which will handle in a certain way previous to the chlorine process will handle in another way after having been treated to the process. First, the process will have lowered the possible activities of the scales of the fibers to the extent that their powers of

(*Concluded on page* 502)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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FIFTY-FOURTH RESEARCH COMMITTEE MEETING

June 13, 1929

THE Fifty-fourth Research Committee Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., at 4.10 Thursday afternoon, June 13, 1929.

The following were present: L. A. Olney, Chairman, Dr. E. H. Killheffer, W. S. Williams, P. J. Wood, Walter M. Scott, Hugh Christison, Geo. A. Moran, Ralph F. Culver, Wm. R. Moorhouse, Wm H. Cady, A. M. Burt, Wm. D. Appel, Prof. E. C. Bertolet, Howard D. Clayton, Winthrop C. Durfee, Walter C. Durfee, Walter E. Hadley, R. W. Hook, Dr. Jos. F. X. Harold, F. R. McGowan, Dr. Hans Meyer, Wm. C. Smith, Alex. Morrison, Secretary.

During the early part of the meeting the matter of definite program for fundamental research and textile chemistry and its affiliated branches was discussed, and it was voted that the chairman of the Research Committee with the assistance of the Sub-Committee on Research Survey compile a definite program on fundamental research. Such a report is to be presented at the first meeting of the Research Committee in the fall.

A preliminary report of the newly appointed Sub-Committee on the Determination of Sizing and Finishing Materials in Textile Fabrics was made by the Chairman, Russell W. Hook. The proposed work of this committee was then discussed at some length.

A second preliminary report of the Sub-Committee on Rubberized Textiles which had been received from Dr. R. E. Rupp, the Chairman, was read, and a discussion followed which was led by F. R. McGowan, a member of the committee.

Chairman Olney reported for the Sub-Committee on Bibliography of Textile Chemistry, Bleaching, Dyeing and Finishing, stating that as yet little had been accomplished owing to the fact that the Chairman, Chas. E. Mullin, was at the present time in Europe. A discussion of the best form of a report from this committee to be printed in the 1929 Year Book followed, and it was agreed that Wm. C. Smith as a member of the committee should gather certain data for publication in the next Year Book.

Wm. D. Appel reported from the Sub-Committee on Research Survey in the Textile Industry, primarily asking for further instructions.

A request from the Cotton Textile Institute that a sub-committee on rayon be appointed was discussed. The Chairman mentioned several possibilities for membership on such a committee and called for suggestions as to others who might be qualified. He stated that he would get in touch with the men suggested, and endeavor to bring about the formation of such a committee during the summer.

Dr. Jos. F. X. Harold reported for the Sub-Committee on Water Proofing Textiles, describing some of his work and promising a condensed report for publication in the Year Book.

Wm. H. Cady, Chairman of the Sub-Committee on Light Fastness, stated that a Third Section of the Comprehensive Report of the committee would appear in the Proceedings of the Association (published in the June 24th issue of the AMERICAN DYESTUFF REPORTER).

Geo. A. Moran reported progress on the work of the Sub-Committee on Washing Tests for Dyed Cotton using the Launder-Ometer.

Howard D. Clayton was appointed Chairman of a newly organized Sub-Committee on Shrinkage of Textiles, with power to select his own committee and make a preliminary survey of the subject and to report the same at the first fall meeting of the Research Committee.

The meeting adjourned at 5.50 p. m.

MAY MEETING OF THE NEW YORK SECTION

THE Annual Meeting of the New York Section was held Friday, May 24, at the Elmwood Country Club, North Paterson, N. J. The meeting convened at eight-thirty, Daniel P. Knowland, Chairman of the Section, presiding.

The regular routine business of the Section was transacted. Following this the Chairman of the Nominating Committee, Mr. Grandage, was called upon for a report. He submitted the following nominations:

Chairman—Percy F. Kingsbury.

Vice-Chairman—Robert N. Gaede.

Secretary—W. H. Wingate.

Treasurer—J. J. Sokolinski.

Executive Committee—P. J. Wood, D. P. Knowland, H. F. Herrmann, Dr. Oscar Flynn.

It was voted, upon motion regularly made and seconded, that the Secretary cast the unanimous ballot of the Section for the gentlemen nominated.

The newly-elected officers were installed in office, and the chair was turned over to Mr. Gaede, since the newly-elected Chairman, Mr. Kingsbury, was not present. (Applause.)

Chairman Gaede—The paper to-night is on the subject of "Indigosols," and will be presented by Mr. Swan, of the Carbic Color & Chemical Company, instead of by Mr. Kuhl, president of that company, who was prevented from being with us to-night. (Applause.)

. . . Mr. Swan presented his paper as follows:

The Indigosols

By JOHN C. SWAN

Carbic Color & Chemical Company

NO series of colors developed in recent years have created more interest, or have been more talked about than the Indigosols, so I think it unnecessary to give you any description of just what they are.

Ever since the introduction of the types other than Indigosol O, the soluble true Indigo, we have been constantly at work trying to take them out of the class of scientific curiosities and find a definite regular use for them.

While Indigosols have been used in increasing quantities ever since their introduction, it has been only for special work of various kinds, and very little regular, large-scale work has been done with them.

In dyeing, the Indigosols have not been used to any extent except for padding plain shades on cotton and rayon. For this work both the steaming and nitrite methods are used and give excellent results. As the Indigosols as a whole have little affinity for the cotton fiber, dyeing other than padding is seldom done.

On silk the Indigosols are used regularly for dyeing yarns, but on piece goods the methods proposed so far do not give satisfactory results.

On wool Indigosol O has been used regularly, chiefly for dyeing raw stock for uniform cloths. A method has been developed for dyeing slubbing in machines with the other brands of Indigosols, and it is now possible to dye light shades on this material that show superior fastness, especially to light, to any other class of dyestuffs. For dark shades the increased fastness is not so marked and the cost is prohibitive in most cases.

The chief consumption of Indigosols has been for cotton printing, chiefly by the steaming method. This requires steaming of the printed goods, either in one of the types of steamer, or in an ager, and as the line of colors was not as complete and the cost higher than the regular vat colors, the Indigosols were used only in special cases.

During the past year our attention was called to a factor in the application of Indigosol, particularly in printing—the use of solvents.

All the Indigosols are soluble in water, some of course more readily so than others, but none of them will remain in solution when made up in concentrated form such as

is necessary for printing, especially when the various chemicals necessary for development are added.

On cotton these partially precipitated color pastes can be used, especially when they are steamed, but on silk or on rayon where penetration is necessary they are useless.

By adding a solvent to the color pastes made up according to the old steaming or nitrite methods, better results were obtained but still not entirely satisfactory, especially on silk.

The next method worked out was the so-called chromate method: the Indigosols dissolved with water and a solvent and made up into the paste without any further addition. After printing and drying the color was developed by passing for 8 to 10 seconds through a developing bath of 8% sulphuric acid, 3 1/3% bichromate of soda by weight at 115° to 120° F.

This method gives excellent results on cotton and some rayon fibers; it has been in use over a year and is still in use on a large scale. The drawbacks are that Indigosol Red Violet IRH requires the addition of Oxalic Acid to the printing paste, consequently the paste will not keep any length of time; the Indigosol Green AB is partially destroyed, and the Indigosol Black IB is over-oxidized to a muddy brown. Also the process does not give good results on silk.

There has been some criticism that the goods may become tendered in the strong developing bath; tests made show no appreciable tendering of the goods even when the time of development is increased 15 seconds, and the temperature to 140° F. There have been millions of yards printed by this method without any complaint of tendering.

The latest process which is now being worked on a practical scale provides for the addition of nitrite of soda and alkaline bichromate of soda to the printing paste or padding liquor.

After printing or padding and drying, development is carried out in a bath of sulphuric and oxalic acids.

The advantages of this process are as follows:

1. With the exception of Indigosol O and OR brighter shades, much better yields, and at least the same fastness, as is obtained by the older methods.

2. Cotton and rayon can be printed, dried, and developed fully in ten seconds without any steaming.

3. Silk, silk and cotton, silk and rayon, or rayon, where penetration is essential, must be steamed or aged five to ten minutes, when perfect penetration is assured.

4. The development can be done in ten seconds or in five minutes or longer, depending on the strength of the developing bath.

5. The use of the solvents gives such an increased yield of color that the cost is considerably lower than with the older methods.

6. The printing pastes or padding liquors have very good keeping qualities; also the printed or padded cloth can lay indefinitely before being developed.

7. The solvents used are acetine, ethylene glycol monoethyl ether and diethylene glycol monoethyl ether, all of which are relatively inexpensive.

We believe that where the fastness of Indigosols at present on the market is good enough they can be used to advantage; and with the advent of newer, faster Indigosols, they will offer distinct advantages over the present vat colors.

Chairman Gaede—It usually is customary for the speaker to answer questions on his paper. If anyone has any questions to ask Mr. Swan I am sure he will be glad to answer them. This was certainly an interesting paper. There must be some questions on it.

If there are no questions I think it is only fitting that we give Mr. Swan a rising vote of thanks.

. . . A rising vote of thanks was extended to Mr. Swan.

Chairman Gaede—If there is nothing further to come before the meeting a motion to adjourn is in order. I hope to see you all at our next meeting, which will be in September.

. . . The meeting adjourned at nine o'clock.

COMMUNICATIONS

Communication from A. R. Macormac

May 21, 1929.

Dr. Louis A. Olney,
Chairman, Research Committee.

Dear Sir: I was glad to see one of the active charter members come out in opposition to the Research Bureau, and on the whole I find myself in agreement with Professor Mullin's stand as given in the Proceedings in the issue of May 13.

Before I go any further, let me give an idea of the background from which I am discussing the matter. I am a B. S. graduate of the College of the City of New York who spent about eight years in the laboratories of dye manufacturers in New York City and then the last five years in mills in Connecticut. Salary and mill hours have been such that my attendance at meetings has been limited to about one meeting of the New York Section per year. Last year I managed to attend the Providence Annual Meeting. So you see most of my knowledge of the business of the Association has been gained from the Proceedings in the REPORTER.

I know quite a few young men, chemists from Yale, Columbia and Massachusett's Institute of Technology, as well as textile men, mainly from Philadelphia Textile

School. Nearly all of these young men hope some day to be able to be their own boss and consider that the best way to do this is through consulting work. If this Research Bureau is adapted it will be far more difficult for them to get started for themselves. However, many of them, due to their present positions, feel they cannot take any part in the opposition. That was my own position until very recently. Fortunately, I am now in a position where I can do so without fear of the consequences, and I should like to have you give this communication space in the REPORTER, feeling that it expresses the ideas of a great many of your younger members.

I propose to limit my discussion of the proposed laboratory to three points:

(1) What shall be the extent of the Research Bureau? (2) Even if it is devoted to pure research, should we start it? (3) What is the function of our Association?

Under No. 1 the point to discuss is whether the laboratory shall do commercial testing. Professor Mullin devotes a large part of his article to this question and goes into great details to show that this should not be done. Briefly, to do so would be competing with our own members and taking away their livelihood, and what seems to me a still greater injustice, preventing our younger members from getting a start of their own. Dr. Killheffer states that this feature of the Bureau has been abandoned for several months, yet he stated at a meeting on March 8 as reported in the REPORTER of April 1, 1929, that a high-grade testing laboratory might be carried on at the same time as a revenue producer.

In Dr. Killheffer's earlier speeches before the New York Section (A. D. R., March 19, 1928, page 179), before the Rhode Island Section (A. D. R., April 30, 1928, page 283), and before the Piedmont Section (A. D. R., Oct. 15, 1928, page 663), the commercial testing idea was much emphasized. In fact, in the original proposal as submitted to the Fiftieth Council Meeting (A. D. R., Feb. 20, 1928, page 118), Dr. Killheffer stated, "Such a bureau would probably be self-supporting within two years!!!" Nowhere in the reports of the proceedings of the Research Committee, as reported in the REPORTER, can I find anything to show that the revenue-producing features of the proposed laboratory have been opposed as being an injustice to our members, and about a month before Prof. Mullin's article was published Dr. Killheffer included this feature in his talk before the meeting of the Research Bureau Committee. If this Bureau is started with commercial testing as a side line, I am very much afraid that it would not be long before the revenue-producing work will be more important than the pure research and then "the tail will wag the dog."

Now for the second point: the establishment of a pure research laboratory. Is it our duty or function to establish such a laboratory? I think that it is not. I know of no instance, either here or abroad, where an association of technical men has done so.

In the discussion of Dr. Killheffer's speech before the New York Section, Dr. Harold said (A. D. R., March 19, 1928, page 183): "Other countries have already succeeded in establishing just this type of laboratory. It is an old matter in England. There are a number of such laboratories serving the textile community in Germany with more or less success *all of them supported either by the town itself, by the local government or by the chambers of commerce.*" Dr. Harold's statement of how these laboratories are supported in Germany seems sufficient evidence that such support in America is not our function. In regard to England, I wish to call attention to an article, "Research in the Textile Industry," by C. M. Keyworth in "Chemistry & Industry" for April 6, 1928, page 360. He states that the British Cotton Industry Research Association was founded in 1919, and its headquarters, the Shirley Institute, completed in 1923. They have a staff of about 100. About £50,000, or $250,000, is spent annually, the money being supplied by subscription of the industry, the Cotton Trade Memorial Fund, and a government grant. Sections of the cotton trade bear the cost roughly according to their capitalization. The Society of Dyers & Colourists, the English association corresponding with ours, and the Textile Institute, have nothing to do with the financial responsibility or direct operation of this institute. In addition there is a Linen Association with an income of about £15,000, a Woolen and Worsted Association with £15,000, and a Silk Association with between £3,000 to £4,000, making a grand total of about one-half million dollars' income each year. In this connection let me suggest that any of our members who believe in our establishing a Research Bureau should read the discussions on pages 503, 579, 624 and 674 of the journal quoted above, and see some of the troubles these research associations are encountering, consider them carefully and remember the old adage, "Don't buy a pig in a poke."

Coming home to America: The American Chemical Society has never even considered a Research Bureau, and it is far more an employers' association than we are. The well known excellent work done by George H. Johnson was supported by the Laundryowners' National Association—an employers' association. When a Textile Research Bureau is started, and such a bureau is one of the crying needs of the industry, it should be started by an employers' association, such as the National Association of Cotton Manufacturers. They are the ones who will benefit and they should take the responsibility.

This question of financial responsibility is a very serious one and should be considered very carefully before we commit ourselves. Dr. Killheffer's ideas on this matter, as set forth in his speech before the Rhode Island Section (A. D. R., April 30, 1928, page 284), calls for 1,000 textile mills giving $1,000 dollars each, thus establishing an endowment fund of a million dollars, and then paying $25 per year each as dues, to give an income of $25,000; revenue-producing work and other sources should bring this amount up to $100,000 income per annum he says. This seems like a respectable sum until we check up and find from Mr. Kelworth's article, quoted above, that the British associations are spending half a million each year and are being criticized for not accomplishing anything. Suppose we start this bureau, and, as may be expected, in several years many of the mills refuse to continue their corporate membership in our association. Then we will have to go begging to the textile industry, or abandon the project and become the standing joke of the industry. In just this way we can do the cause of scientific research an incalculable injury.

Rather than attempt to establish a Bureau we should urge the textile industry to employ more fully the opportunities for research already existing, such as the Mellon Institute, the Bureau of Standards, the Research Bureau of the Laundryowners' Association, the United States Testing Company, and especially the graduate departments of the colleges and universities. In this connection I should like to call Dr. Killheffer's attention to the fact that of the 173 fellows at the Mellon Institute only four are on textile subjects (see News Edition, J. I. E. C., April 10, 1929). This, I submit, show very little demand from the industry for such a laboratory.

We, as the organization of technically trained men of the industry, should be conversant with the facilities for research in our industry and should urge upon our employers the use of these agencies, but should not attempt to tell our employers how they should run their business or invest their profits. Above all, it is not our function to assume financial responsibility for research.

As regards the objects of our Association: Prof. Mullin says, "One of the greatest services the Association can render the textile industry is to improve the social and economic status of its members." Dr. Killheffer says, "The Council has always taken the broad view that its activities should be truly conservative and for the good of the industry as a whole. It is, of course, interested in the individual welfare of its members and it believes that in adopting work for the benefit of the whole industry it is promoting the welfare of its members." In other words, Prof. Mullin's attitude is members first, industry second. Dr. Killheffer's, industry first, members second. It seems to me that our Association, like any other, should consider its members of prime importance, not secondary to the industry which employs about half of them. I believe that such an object should be definitely stated in the Association's constitution, and I feel sure it would have the support of the vast majority of our membership if put as an amendment to Article II of our constitution.

Dr. Killheffer says, "I cannot subscribe at all to the thought that our Association as such should so far forget its function as a technical society as to actually make a trade union campaign for better salaries." A few paragraphs before he speaks of "our association of technical men." Now, what does Dr. Killheffer consider our society? I consider it a society of technical men, not a technical society. To illustrate, the American Chemical Society and the Society of Chemical Industry are technical societies and their chief function is publication. The American Medical Association, the American Society of Mechanical Engineers, and the American Institute of Chemists are societies of technical men. I hope I have made the difference clear. One of the chief functions of many such societies of technical men is to conduct an employment bureau. The American Society of Mechanical Engineers not only does this but will arrange an interview between a member and the representative of a company with which he seeks employment. They do not consider that they are forgetting their function as a society of technical men; quite the contrary, they are fulfilling one of their chief functions.

The insinuation that a campaign for better salaries would lower the dignity of our Association and the use of the term "trade union" is just camouflage. Such a campaign is the chief object of the American Institute of Chemists and they are fighting towards this goal by all means possible. Far from decreasing their prestige and standing, I venture to say their membership has shown a greater percentage increase than that of any other scientific or technical society in the past year. Surely if such well-known men as Treat B. Johnson of Yale, H. R. Moody of the College of the City of New York, Charles H. Herty, M. L. Crossley, Milton C. Whitaker, and especially the present president, Dr. Frederick E. Breithut, are willing to lend their names to a campaign for better salaries, we should not consider it undignified. I have known Dr. Breithut personally since 1920, and no finer example of a broadly cultured, well-educated gentleman ever existed. He is behind this campaign for better salaries with all his heart and soul.

Much more might be said but I think I will limit my discussion to the three subjects named and let some of the other members discuss other points. Dr. Killheffer says, "I am somewhat at a loss to know just what con-

clusion is meant to be drawn from some of the remarks made" by Prof. Mullin. I feel the same way about some of Dr. Killheffer's remarks. So that there will be no misunderstanding in my case let me restate my stand.

First—To start a Research Bureau that will do commercial testing or consulting work is morally wrong because it will be to a certain extent taking away the livelihood of some of our own members.

Second—To start a Research Bureau for pure research only is not our function as an association of technical men. Besides, we cannot finance such a Bureau without being more or less continually forced to go begging to the textile industry for money, which to my mind is a far more undignified procedure than that of running an employment bureau.

Third—Our Association is the American Association of Textile Chemists and Colorists, i. e., an association of technical men—not a technical association. As such it should consider its members first and not the textile industry first. Therefore, we could and should try to better the social and economic status of our members and specifically should conduct an employment agency similar to that of the American Society of Mechanical Engineers.

Finally—In an editorial in the AMERICAN DYESTUFF REPORTER for May 27, 1929, an attempt is made to place Professor Mullin in what I consider a false position. He is quoted as being a conservative and as opposed to co-operative textile research. I believe that this is a misinterpretation of his stand. My own has been stated before in this letter, but it will bear restatement. I believe textile research should be conducted by the textile industry, not by the American Association of Textile Chemists and Colorists. To follow out the neat little fable of the tramp steamer (which I assume is to be taken as allegorically representing the textile industry) it seems to me that the engineer has frequently and repeatedly advised the captain to shift the coal. By so doing he has fulfilled his duty. It would be wrong on his part to take his men out of the engine room and put them to work shifting the coal and neglect to keep up steam in the boilers.

Recent news items and reports in various textile journals seem to me to point out the logical solution of this problem. Dr. Killheffer's plan is an excellent one but he has been absolutely wrong in the method by which he has attempted to develop it. As Dr. Edwards has pointed out, the Textile Research Council or some such organization is the proper agency. Dr. Killheffer and Dr. Olney, as well as other members of our Association, have warned the captain of the necessity of shifting the coal. If the captain does not shift it we should keep on calling the matter to his attention until the coal is shifted, but should not attempt to shift it ourselves.

ALFRED R. MACORMAC.

Communication from the President

In connection with the comments by Alfred R. Macormac printed above, I shall try to answer specifically and as briefly as possible several of the questions raised.

Under the heading of testing laboratory Mr. Macormac calls attention to the fact that I stated that this part of the idea has been abondoned for several months, and then he refers to the meeting in New York of March 8, 1929, at which time I am supposed to have resurrected the idea. The fact is that the March 8, 1929, meeting in New York as written in the Proceedings in the AMERICAN DYESTUFF REPORTER does not quote my remarks at all, but is a report of that meeting written by the temporary secretary, and while it is a very complete and good report, it obviously does not set down all that was said at the meeting nor the reasons therefore. The testing phase was again discussed at that meeting because someone present asked about it and not because it was being specifically advanced as a plan to follow; as I have stated before in my reply to Professor Mullin, that phase of the plan was abandoned at about the time I said it was. The fact that it is still discussed at all is because someone else brings it up for discussion, just as is being done in this present instance.

There was a time when this phase of the plan was emphasized considerably as a possible way of bringing in a substantial income, but many objections were advanced which seemed to make this inadvisable, but not from the standpoint of possible injury to any of our members having a private practice. In fact, at the meeting of the New York Section, February 24, 1928, Dr. Himebaugh, director of the Pease Laboratories, Inc., New York City, stated, "From the commercial laboratory standpoint, I do not believe that the Association laboratory would interfere in any way with the individual laboratories."

I think that perhaps Professor Mullin and Mr. Macormac both overlooked the fact that fundamental research on a subject so large as the one we are discussing is not usually conducted by individual workers, or as they are pleased to call them, consultants in the industry. These men usually deal with individual problems. They may, incidental to their regular work, do some research, but it is not of a regular systematic nature that we have in mind when we speak of fundamental scientific research, which, as everyone knows, is usually anything but remunerative in the sense of the day to day livelihood.

Should we start research? In answer to this, I would

like to emphasize the fact that the reason why our Association has been talking along this line at all is apparently the same reason that actuates other men in and out of the textile industry to talk about the same subject. We haven't any particularly set ideas worked out in every small detail, and, as a matter of fact, I have so stated in several of my addresses. I have said what I am glad to repeat now, that we are suggesting a tentative plan in the hopes that eventually by addition to it, by alteration of it, or in conjunction with some other bodies, some plan may be worked out that is feasible of adoption, so that fundamental research will be started by and for the textile industry of the United States. As Dr. Edwards remarked at a recent conference that we had in Atlantic City on this same subject, "We need evangelists to preach the doctrine of research," and in this case some of us in our Association have perhaps acted as evangelists. After all, all of us realize that if this is attempted at all it will be for the benefit of the textile industry, and the textile industry will have to pay for it. Nowhere in the plans that we have talked about has it been proposed that our membership should pay the bill. If the textile industry doesn't consider this whole idea as worth while, then, of course, our Association has done its full duty in emphasizing its readiness and willingness to co-operate in any such movement. So far I personally have not heard anyone express an opinion to the effect that the textile industry in the United States does not need considerable research.

Financing—The matter of financing is very important, and the suggestion that I made for an original endowment doesn't necessarily mean that that would be sufficient. The idea that I have tried to emphasize is that if an activity like this is started in the United States it should be started on the basis of an endowment and not on the basis of yearly subscriptions, and this suggestion is made simply because we know about the difficulties of some of the foreign associations who find it necessary "to go begging," as Mr. Macormac puts it.

I take exception to the remark made that I put industry first and members second, and I think a more careful reading of what I had to say will show the fallacy of this interpretation.

Better Salaries—Another point that Mr. Macormac speaks about is based on only a partial quotation from my remarks. When I previously stated that I was somewhat at a loss to know just what conclusion is meant to be drawn from some of the remarks made by Professor Mullin, I stated this specifically under the heading, "Scope of Textile Research," and I asked specific questions.

Mr. Macormac, in conclusion, says that my plan is an excellent one, but that I have been absolutely wrong in the method by which I have attempted to develop it. Now I am perfectly willing to accept that statement at its face value and start from the point where we agree, if there is any such point, and if I am wrong in the way I have tried to work up interest I would welcome, and I know the other members of our Council and Research Committee would also welcome, constructive ideas as to how the matter should be developed. All that has been offered so far is entirely destructive and apparently advocates a policy of "hands off."

E. H. KILLHEFFER.

Communication from the Chairman of the Research Committee

While I do not intend at this time to enter into an extended discussion of Mr. Macormac's communication, I cannot refrain from commenting upon two of the views he has expressed.

I think that Dr. Killheffer, in his reply published above, has ably discussed the matter of the Research Bureau, and I need add but little other than to say that I know Mr. Macormac labors under a great disadvantage in not knowing what actually transpires at some of the meetings to which he refers. The last paragraph of his communication would lead one to believe that both Dr. Killheffer and myself were opposed to the Textile Research Council or some such organization. For Mr. Macormac's enlightenment, and in order that my position in this connection may be perfectly clear, let me say that at the Atlantic City meeting of the Textile Research Council held May 24, 1929, I emphatically stated that it was my belief that no great headway could be made in developing co-operative textile research and financing the same except through one central body which officially represented each and every phase of the textile industry. I furthermore stated that the Textile Research Council, if reorganized to some extent so as to include upon its executive body representatives, officially appointed by such bodies as the Cotton Textile Institute, the Wool Institute, Rayon Institute, Cotton and Woolen Manufacturers' Association and others of this type, might prove to be just the organization best fitted to proceed with such a project. Furthermore, I am sure that Dr. Killheffer shares this opinion with me.

It is my belief that through such a central body a fund of several million dollars could be raised as a foundation for all phases of textile research, economic as well as technical. It would be in connection with research along the lines of textile chemistry, dye application, bleaching and finishing that the American Association of Textile Chemists and Colorists might well become one of the chief co-operating and consulting bodies, and act as supervisor of laboratory work.

My second comment is in regard to Mr. Macormac's third point, namely, the objects of our Association. After eight years' acquaintance with the aims and aspirations of the founders and the subsequently elected executive officers, I cannot help drawing one of two conclusions. Either Mr. Macormac is not familiar with the objects of the Association as set forth in the constitution and prominently published on the frontis page of each issue of our Year Book, or he has interpreted them in quite a different way from what I have always believed to be the intention of those who originated them. I grant that the American Association of Textile Chemists and Colorists is an association of technical men, but I can see no grounds whatever for stating that the Association is not a scientific and technical association as well. He states that he hopes he has made this point clear, but I must admit that as far as I am concerned he has not done so.

The second object of our Association as printed in the constitution reads as follows: "To encourage in any practicable way research work on chemical processes and materials of importance to the textile industry." From the very beginning the Council has believed that there was no more practicable way of encouraging research work than by actually doing some as an association, and the Research Committee proceeded at once upon that basis, and as far as I know they still stand committed to this principle as regards their future policy. This fact, I believe, is well demonstrated by the loyalty and actual sacrifices of time and financial expenditures which many of the members of the Research Committee have made towards the promotion of its work. As an illustration, the twenty-three members who attended the Fifth-fourth Research Committee meeting traveled an average of over three hundred fifty miles each in order to attend this meeting, and one member came from New York by aeroplane in order that he might be there on time.

I have expressed the opinion many times and it is still my belief that the time will come when the executives of the textile industry will appreciate the service that the American Association of Textile Chemists and Colorists is rendering both to their employees and to the industry in general, and be pleased to voluntarily lend their financial support to the pursuance of its program.

L. A. Olney.

Applicants for Membership

Berry, Stephen A., dyer, Olson Rug Company, 32 South Laflin Street, Chicago, Ill. Sponsors: A. T. Brainerd and N. A. Ruston.

McGee, James E., assistant superintendent, Paterson Mills Company, Inc., Rosemary, N. C. Sponsors: W. M. Hunt and H. A. Barnes.

Pickup, John H., bleacher, finisher and dyer, Carolina Cotton & Woolen Company, Fieldale, Va. Sponsors: W. M. Hunt and H. A. Barnes.

Sullins, James M., salesman, Calco Chemical Company, Bound Brook, N. J. Sponsors: L. L. Bamberger and I. V. Sheffield.

Wieland, Herbert E., assistant chemist, Ayer Mills, Lawrence, Mass. Sponsors: Stephen N. Mason and Louis F. Bume.

Wainwright, Charles B., chemist, U. S. Finishing Company, Fifth Street, Norwich, Conn. Sponsors: John B. Dick and Richard B. Earle.

Wentz, William M., chief dye tester, The Newport Chemical Works, P. O. Box M, South Milwaukee, Wis. Sponsors: Dyer S. Moss and Philip H. Stott.

Zwicky, Rudolph, president and manager, Helam Chemical Company, Inc., 7339 Coles Avenue, Chicago, Ill. Sponsors: M. A. R. Selisch and Paul O. May.

Changes of Address

Baird, William D., 984 Whitlock Avenue, Bronx, N. Y.
Biery, Thomas J., 45 Salen Street, Andover, Mass.
Biach, Dr. L. K., 218 Williams Avenue, Hasbrouck Heights, N. J.
Black, James W., Kinston, N. C.
Buddy, Gridley, 446 Ocean Avenue, Brooklyn, N. Y.
Clendinning, Thomas, Patton Hotel, Chattanooga, Tenn.
Chapman, Thos. H., 29 Richardson Avenue, Utica, N. Y.
Dana, A. N., 145 President Avenue, Providence, R. I.
Dunlop, E. S., 721 Main Street, Royersford, Pa.
Frazie, M. D., Box 274, Nashua, N. H.
Golden, Andrew C., 631 Maple Street, Fall River, Mass.
Govier, G. E., 31 Russell Road, Whalley Range, Manchester, England.
Lilley, S. Clark, 147 Woodlawn Street, Hamden, Conn.
Mackie, Robert F., Harrisville, R. I.
Nash, W. F., c/o Erben Harding Company, Tacony, Pa.
Scheuer, Edwin B., Arizona Baltimore Hotel, Phoenix, Ariz.
Selya, Hyman P., 178 Purchase Street, Boston, Mass.
Smith, James O., 507-330 Bay Street, Toronto, Ont., Canada.
Sobocinski, Anton, 74 South Main Street, Seymour, Conn.
Stiegler, Herman H., 2725 East Drive, Fort Wayne, Ind.
Veevers, Arthur, 11 Euclid Avenue, Riverside, R. I.
Ward, Richard W., 92 Laurel Avenue, Providence, R. I.
Washburn, J. M., Jr., 24 Coolidge Road, Arlington, Mass.
Wilbur, Clifford K., 111 Richard Street, Auburn, R. I.
Witte, William, Ackerman and Jerome Avenues, R. F. D. No. 2, Ridgewood, N. J.

CONFERENCES CLEAR UP MANY MISUNDERSTANDINGS

By George H. Johnson
Director of Research, Laundryowners' National Association

Of what value is group discussion of a merchandising-technical problem like Dye Fastness? In the well-informed opinion of Mr. Johnson much more results from a thorough airing of such a problem than a mere flow of words. The following is reprinted from "The Laundry Standard," organ of the Laundryowners' National Association, which appears weekly in the Daily News Record of New York.

DURING the past two years in particular there have been many attempts on the part of American business men to meet around conference tables and discuss mutual problems and their solution. For example, two years ago in Washington and New York the problem of the shrinkage of summer washsuits came up for discussion. Representatives of the various interested groups were on hand, including retailers, converters, shrinkers, washsuit manufacturers, importers, weavers, government representatives, dry cleaners, and laundryowners. As a result of these meetings, much misunderstanding was cleared away. Each group learned something about the other fellow's problems—and which of the above list of industries does not face rather trying problems at times? As a result of these conferences, the following good may be said to have been accomplished:

1. The whole problem of the shrinkage of washsuits was discussed from *all angles* in one meeting for the first time.
2. Shrinkers, on their part, agreed to make a scientific study of the various processes of pre-shrinking washsuit materials to determine which method produced the best results.
3. Retailers agreed to be more careful when purchasing washsuits and when fitting their customers.
4. Dry cleaners and laundryowners agreed to adopt scientific cleaning and pressing methods as recommended by the National Association of Dyers and Cleaners and by the Laundryowners' National Association.

Then we read in the press of the following trade practice conference held recently in and about New York:

1. A conference to discuss the possibility of devising practical specifications that will assist the consumer in purchasing sheetings.
2. A similar meeting designed to prepare consumer buying specifications for blankets.
3. Weighting conferences that are intended to eventually solve the entire problem of the overweighting of silks.

And then a trade item appears in which efforts of the Research Committee of the American Association of Textile Chemists and Colorists to interest the great textile industry in research was discussed. Truly these are all healthy signs and trends that cannot be altogether ignored.

There are some who believe that conferences of this sort represent just so much wasted time and effort. We doubt this statement greatly. We are still visionary enough to hold to the opinion that if the various groups interested in problems, such as have been listed, come to the conference table with open minds, much good-will will be accomplished. On the other hand, we will be the first to admit that if certain factions in trade practice conferences hedge and attempt to retard progress at every opportunity, little good will come from an exchange of ideas. Argue as one will, textile manufacturer, converter, wholesaler, retailer, and laundryowner alike are forced to admit that consumer demand is largely responsible for the present-day interest in color fastness, in fabrics that shrink only a reasonable amount, and in consumer specifications. It is certainly no exaggeration to say that consumer demand is at the bottom of many of the conferences that have recently been held in New York. There are some who argue that the consumer does not know what she wants. This may be true when technical points such as thread count, twist, weight per square yard, and tensile strength are concerned. But it should not be overlooked that Mrs. Housewife does know that she wants colors of reasonable fastness to light and to washing and wash garments that will fit her husband, her children and herself after washing as well as before. The wise business man who handles textiles will endeavor to head this consumer demand in the right direction by furnishing fabrics and wearing apparel that are designed to give long-run consumer satisfaction rather than immediate financial return. The long-run policy of furnishing consumer satisfaction with every fabric that is made will pay the highest dividends in the end.

THE TERM "RAYON" WINS AGAIN

In the Hawley tariff bill now before Congress, rayon is accorded a schedule of its own. Paragraph 1313 of this bill defines rayon as follows:

"Whenever used in this act the term 'rayon' means the product made by any artificial process from cellulose, a cellulose hydrate, a compound of cellulose, or a mixture containing any of the foregoing which product is solidified into filaments, fibers, bands, strips or sheets, whether such products are known as rayon staple fiber, visco or cellophane, or as artificial, imitation or synthetic silk, wool, horsehair or straw, or by any other name whatsoever."

Speaking of the importance of the bill, the publication "Rayon" says that the rapid acceptance of the term rayon throughout this country is one of the most noteworthy achievements in modern industry.—*"Accuracy," Bulletin of the Better Business Bureau of New York.*

CALCO BUYS TEXTILE CHEMICAL COMPANY

Facilities Also Increased by Purchase of King Department

The plant, business and good-will of the Textile Chemical Company, of Providence, R. I., were taken over last month by the Calco Chemical Company, of Bound Brook, N. J., well known dyestuff manufacturers. Calco announced at the same time that it had purchased the Sulphur Dioxide Division of the King Chemical Company of Bound Brook.

The statement issued by the Calco Chemical Company concerning these transactions follows:

"We have further increased our manufacturing facilities through the purchase of the plant, business and good-will of the Textile Chemical Company, of Providence, R. I., and the Sulphur Dioxide Division of the King Chemical Company, of Bound Brook, N. J.

"The Textile Chemical Company has specialized for some years in the manufacture of Alpha Naphthol, Naphthol Yellow C. I. No. 10, Azo Yellow C. I. No. 146, Fast Light Yellow 3G C. I. No. 639, and Benzo Fast Red 8 BL C. I. No. 278. It is our intention to continue these products and the various standards that they have developed.

"The King Chemical Company will continue to operate its Fertilizer and Farm Chemicals Divisions, but the production and sale of Liquid Sulphur Dioxide will be carried out in our main factory, where we have every facility for the prompt shipment of cylinders, tank and multi-unit cars.

"We request that, from this date on, all orders and inquiries for these products be addressed to the Calco Chemical Company, Inc., at its main office or to one of its several branches."

The King Chemical Co. issued the following statement regarding sale of its Sulphur Dioxide Department:

"We wish to announce that we have sold to the Calco Chemical Company, Inc., of Bound Brook, N. J., the plant, business and good-will of the Sulphur Dioxide Division of our factory.

"The necessity of expanding our manufacturing facilities, in order to better serve the increasing requirements of our customers, has been felt for some time, and we have decided that this could best be accomplished by consolidation with one of the larger companies already in the field. The Fertilizer Division of our plant will be continued in operation as heretofore.

"We take this opportunity of thanking our customers for their co-operation and ask that it be continued with our successors."

William J. Demers, for the past ten years superintendent of dyeing at the Worcester Woolen Mill Company, Worcester, Mass., has recently accepted a similar position at the Webster Mills of the American Woolen Company, Webster, Mass. He succeeds David A. Prevost, who recently resigned.

HOW MUCH SHOULD A DYER KNOW ABOUT WOOL?

(*Concluded from page 492*)

dovetailing with the scales of neighboring fibers will become quite extinct.

Any dyer who possesses a sensitive touch can notice the difference in treated and untreated wool by the rule of thumb. The original fiber will feel rough while the chlorinated one will feel smooth.

If a microscope is used to examine the fibers, they will resemble the specimen shown in Cut B, Fig. 1, while the scales are intect, or the specimen shown in Cut B, Fig. 2, after the scales are wholly or partly effaced by destroying them. The percentage of shrinkage of the wool after treatment depends upon the extent of the destruction to the scales. Sometimes the process is weakly performed and goods which were intended to be unshrinkable shrink as if no effort had been made to prevent felting. Again the process is too forcibly carried out, and while the shrinkage is prevented the wearing qualities of the goods are lowered, owing to the decreased tensile strength and pliability of the yarns.

Chlorinated Wool Is a Changed Wool

Wool and wool fabrics, when properly treated for unshrinkability, almost always increase in luster and at the same time increase their infinitive properties for dyestuffs. The exceptions occur when strenuous chemical methods are employed to entirely eliminate the scale structure of the fiber. We have seen specimens of fibers which have been so thoroughly impregnated with acids in an effort to make them non-felting that they have been thinned down so far that the base cortex structure of the fibers shows under a glass.

Such stock may dye easily because there will not be much surface structure to hinder an effective penetration of the dye. But there will be complaints from the commission houses about the poor wearing properties of the cloth.

As soon as the fiber is deprived of its natural covering of scales a complete disintegration may set up, as the mass of cells comprising the body will separate. This action can be demonstrated by placing some of the fiber in sulphuric acid of sufficient strength to destroy their outer tissue. It can be done between two cover glasses. Then if one of the treated fibers is examined microscopically it will be observed that the spindle-like cells composing the interior of the fiber have become loose wherever the covering is absent, as shown in Cut B, Fig. 3.

Consequently the object in rendering the wool unshrinkable is not to deprive the fibers entirely of their natural cover, but to so reduce the edges of the scales to a point where they cannot produce felting.

Several methods of chlorinating wool are used. It is commonly accomplished by what is known as the hypo-

chlorite process. The well-washed wool is usually steeped in a solution of hypochlorous acid, made by adding dilute hydrochloric acid to a solution of sodium or calcium hypochlorite (bleaching powder). The time and temperature of the chlorinating bath vary somewhat with the concentration of the solution. After this treatment the wool is washed and well rinsed, and finally to remove the last traces of chlorine may be entered into a bath made up with a small quantity of sodium bisulphite.

The point to bring out is that the dyer should know the wool that is going to be rendered unshrinkable. Fine, soft, lofty wool is not going to withstand the severity of treatment which tough wool will withstand and still dye well and wear well when in the goods. We have seen young lambs' wool of snow whiteness chlorined the same as sun-browned wool of old sheep. This could not happen in a dyehouse in which the dyer is familiar with the characteristics of the different wools which come to him for dyeing.

THE WORKER'S HEALTH

By Helena L. Williams

GOOD health is the concern of every working man and woman. Not to have it means the loss of the good things of life, for the comforts that a full pay envelope provides are reduced when disease attacks the body. Not only the individual himself suffers, but often the entire family, and worry, itself a dangerous ill, becomes an additional hindrance to recovery.

Yet it is not very difficult for a normal person to keep in good physical condition. Nature is a good doctor, and, given half a chance, she will repair a good deal of damage. One of her best assistants is moderation in living. An overloaded stomach, overtired muscles or an exhausted brain cannot be kept in normal functioning order indefinitely. Neither can an undernourished body, flabby muscles and an idle mind.

The human body needs three square meals a day, the amount and kind of food depending a good deal upon a person's job. The mechanic needs heavier food and more of it than the desk worker; the former burns up more energy and so requires more fuel. Both, however, need properly balanced meals consisting of starches such as potatoes, macaroni and cereals, and green vegetables such as spinach, cabbage, green peas, beet greens and kale. They should drink plenty of milk; and meat once a day is enough. A hot noon hour lunch is better than a cold one.

Exercise and Rest

The amount of rest and exercise the worker requires also depends largely on his occupation. A steel worker needs to rest his tired muscles; the office worker should do regular exercises at home or in a gym. Both, however, may be in need of recreational exercise such as baseball, swimming, rowing and dancing. These not only give the body activity but at the same time are a mental tonic.

Overwork is dangerous to health because the body needs sufficient rest to throw off the fatigue poisons that accumulate with mental and physical exertion. Fatigue, though a natural and healthy condition, must not become too great a burden to the blood and nerves. Of fresh air no normal person can have too much. Even in cold weather bedroom windows should be opened at night.

A yearly physical examination by a good physician is an investment in health. Small disorders can be discovered by this means and treated with little expense and loss of time, whereas to wait for them to "wear off" means courting serious trouble later. Tuberculosis, for example, begins with such ordinary sympsoms as a cold that hangs on, slight cough, loss of appetite and lasting fatigue. Patients who go to the doctor in time and take treatment have a good chance of recovery. As the disease progresses, the possibilities of checking it become less and less. One of the most important phases of the anti-tuberculosis campaign is to educate the public to recognize the early symptoms and go to a sanatorium in time

NEW IDEAS FOR RESEARCH

Our present prosperity has resulted more largely from a flow of new ideas than from a flow of money, writes Floyd W. Parsons, in "The Advertising and Selling Magazine." His article is entitled "Everybody's Business." Mr. Parsons expresses the opinion that "never before were discovery and invention carried on with such activity" and then proceeds to cite illustrations of new ideas that have been adopted by industry. In drawing up his conclusions in the article, Mr. Parsons points out that the price of business progress to-day is scientific research.

HERCULES POWDER CONTROLS CELLULOSE PLANT

Officials of the Hercules Powder Company have announced the merging of the Virginia Cellulose Company, of Hopewell, Va. While the Hercules Powder Company will assume full control of the Virginia concern, the plant will operate as in the past.

The financial details of the transaction were not made public. According to a statement from R. H. Dunham, president of the Hercules Powder Company, "The purpose of this change is to directly integrate this industry into the Hercules organization, giving it the benefits of centralized engineering and research, with the idea of providing better service to users of this product."

Judge G. G. Rheuby and C. A. Higgins, directors of the Hercules Powder Company, were also directors in

the Virginia Company. P. B. Stull, former president of the Virginia Cellulose Company, now abroad, will continue as general manager of this new department of Hercules Powder Company.

The Virginia Cellulose Company is said to be the largest manufacturer of purified cotton linters cellulose in the world, and in the past has sold its product to competitors of Hercules Powder Company. Hercules will continue on the same plan, it is pointed out by President Dunham, only with increased service.

METZ PRIZE AWARDS AT TEXTILE HIGH SCHOOL

The award of annual prizes for chemistry, dyeing and batik work has been announced by Textile High School of New York City. The prizes were instituted by Col. Herman A. Metz, president of General Dyestuff Corporation, to create and promote interest in these important phases of textile processing.

The recipients of prizes at the June Commencement of this school were: for Batik and dyeing, Giovanna Nicotina and Mary Bekoff; for chemistry and dyeing, Matthew Rothman and Alfred Szabo. As in the past, competition for these prizes was keen and the work produced was of such excellent quality that the judges were unable to name the winners until the closing day of the semester.

BRADFORD NEEDS SCOURING SOAPS

Certain industrial soaps used by the wool industry of Bradford, England, must be imported, according to information from the consul at Bradford, A. R. Thomson. Bradford, as is well known, is the center of British wool manufacture, and consequently its consumption of scouring and other soaps used in wool processing is very large. The demand is particularly for that kind of hard or soda soap made from caustic soda and vegetable or animal oils or fats with cotton seed as the common base. The growing of the basic components of these soaps is not possible locally because of the climate, and consumers are dependent for the larger part of their supply on imported products. Similar quantities of soft (potash) soap, containing caustic potash in combination with oils and fats, are used in some manufacturing plants. The dyeing trade uses a brand of bar soap, containing 80 per cent tallow and 20 per cent cocoanut oil, which is flaked upon using. The market, however, is dominated by the hard soaps.

CALCO CLOSES FOR VACATIONS

The factory and main office of the Calco Chemical Company, Inc., Bound Brook, N. J., will close for two weeks, beginning August 10, in order that all employees may take their annual vacation at the same time, instead of having vacations distributed over the summer. Emergency orders for small quantities, it is announced, will be handled from branch stocks.

DU PONT ANNOUNCES RAYON DYES SERIES

The popularity of rayon apparel has created a demand for dyes that possess the particular properties which make it possible to obtain level dyeings of satisfactory fastness in a variety of shades, even on mixed fabrics. A recent announcement from the Dyestuffs Department of E. I. du Pont de Nemours & Co. describes a new series of colors for rayon developed in the Du Pont laboratories with the object of eliminating, so far as possible, the uneven results which are so apt to occur when direct dyes are used.

These colors, the announcement states, can be used on both skeins or pieces, and have two outstanding features—good dyeing qualities and great evenness of shade. It is further claimed that all of the colors are sufficiently fast to light and washing for the purpose for which rayon is generally used, such as underwear, dress goods, etc., and are suitable for either plain or discharge patterns.

The line includes Du Pont Rayon Brown G (pat. app. for), Du Pont Rayon Brown M (pat. app. for), Du Pont Rayon Bordeaux B (pat. app. for), Du Pont Rayon Bordeaux 3B (pat. app. for), Du Pont Rayon Violet 4R (pat. app. for), Du Pont Rayon Violet 3B (pat. app. for), Du Pont Rayon Navy Blue N (pat. app. for), Du Pont Rayon Green 4B and Du Pont Rayon Black B.

LYONS DYE WORKS TO DESIGN

The services of a fully equipped art department will be offered to its clients on August 1 by the Lyons Piece Dye Works, of Paterson, N. J. The section will be under the supervision of Henry Bosehans, and its chief function will be to co-operate with clients in the development of designs and colorings. The company has had such a department under consideration for some time, according to Charles H. Newcombe, president of the Lyons Works. Mr. Bosehans will develop his own organization for the art activities of the company.

NEW SOUTHERN PLANT FOR RAYON CHEMICALS

Production has been started in the new plant of the Stauffer Chemical Company at Roanoke, Va. The plant manufactures carbon disulphide, a compound used principally in the treatment of rayon fibers and as a substitute for methyl chloride. It will be shipped in tank cars to Southern and Eastern points, and it is expected that a daily output of twenty tons will be reached when the plant is operated at its maximum. Work must continue night and day. The plant is the only one of its kind in Virginia and employs twenty.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
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BORAH ON AMERICAN MERGERS

WHILE the Senate Committee on Finance concluded its hearings on the tariff bill last week, protests were received by the State Department from twenty-five foreign nations against rates proposed in the bill. Commenting upon these protests, Senator Borah of Idaho declared:

> It is natural, and I think perfectly proper, for foreign people to bring to our attention what they conceive to be the probable effect of our proposed legislation relative to the tariff. . . . The effect abroad is one of the elements which ought to be considered in making a tariff.

This sounds fair and broadminded, but while we are thinking about it we are suddenly disturbed by Mr. Borah's next utterance:

> In my opinion the real kick against the House tariff bill is with our own people and not with the people abroad. . . . When we take into consideration the mergers and the combines which are being formed with reference to everything which goes into one's stomach and onto his back, and then take into consideration the aid which is given such mergers by the House bill, I think it is the American people who had better be vigilant as to what is happening.

At this point somebody should have exclaimed, "Tut, tut, Mr. Borah; are you forgetting the mergers in European industry?"

Surely Mr. Borah knows that Europe has cartels which tower high above American trusts in their productive power, in their organization and capitalization, in their menace to small competitors, in their menace to the American people. Is it possible that Mr. Borah has never heard of the Interessen Gemeinschaft Farbenindustrie? Does he not know that England has its Imperial Chemical Industries, Ltd., the largest consolidation of industry in all Great Britain? Can Mr. Borah really believe that the recently formed American-I. G. is merely an American chemical company, simply because a few American bankers are on its directing board, simply because it has been financed by Americans?

We heartily echo Senator Borah's warning, "It is the American people who had better be vigilant." But to us the menace is not the pending tariff bill.

UNSETTLED TARIFF WEATHER

THE Senate will return to its chambers to renew its special session August 19. While it has been in recess the Senate Finance Committee has steadily pursued its hearings on the schedules of the Hawley-Smoot Tariff Bill. Hearings on the free list were completed last week, and were followed by a discussion of the administrative provisions of the bill.

Senators Watson and Reed, members of the Finance Committee, conferred July 11 with the President and later they declared that every effort will be made by the Republicans in the Senate to complete the tariff by August 19 and to enact the bill before December 1. May their optimism be well-founded! Long suspense over pending tariff legislation always disturbs the peace of mind of industry and business.

Meanwhile just as many brickbats as bouquets fly around the Hawley-Smoot bill. The attacks have not been concentrated upon the rates, like those on sugar, nor upon the administrative features, such as the flexible provisions or the basis of valuation. There still exists a strong opposition to the bill as a whole. Senator Simmons very recently tried to incite more prejudice against it by labeling it as "discriminatory, unfair and dangerous." Little flares of Senatorial opinion like this lead one to believe there may be much more of a fight to put H. R. 2667 through the Senate than anyone has so far suspected.

In the first place there is an unquenchable sentiment against the rates in some schedules. One subject discussed by Senators Reed and Watson with President Hoover during their conference, in fact, was the possibility of reducing some of the House rates described by Mr. Watson as "too high." In a statement published last week Senator Edge of New Jersey said:

> The Finance Committee is securing the necessary information upon which fair and unprejudiced decisions can be made. Whether the final result will warrant more reductions than increases no one can definitely foretell at this time. However, judging from the evidence presented to the committees of which I am a member, I am of the opinion that the information will justify a cutting down of the House bill.

In the second place, many protests have been received from foreign countries that seem to fear danger to their

trade with America if the Hawley-Smoot tariff goes through with its present rates. Italy, Spain and Sweden were among those that filed protests last week.

Thirdly, not every Senator is convinced that the flexible provisions should remain in the bill. Unfortunately, not every Senator believes the President should be granted power to raise or lower rates of duty to the extent which these provisions allow, in order to equalize the conditions of competition in our home markets.

Lastly, the basis of valuation very clearly remains an issue. It may easily become the major issue on the floor of the Senate in every controversy over the administrative provisions. Whether to retain foreign valuation or force a swing to United States value, or possibly extend the American selling price basis to paragraphs other than those covering coal tar products, these are still open questions in some quarters. If a decision is reached to change the valuation base in any schedule or group of schedules, that might start one of the most heated tariff battles in Senatorial history.

FOR THE FUTURE OF FAST DYES

"THE greatest insurance policy that the American textile industry possesses is the American synthetic organic chemical industry." Speaking at the recent meeting of the Piedmont Section of the A. A. T. C. C. on "Dyes and the Tariff," Dr. E. H. Killheffer sought in these words to nail down his arguments for adequate protection of our dye industry. Plainly he implied that a strong domestic chemical industry will, more than anything else, insure our mills against foreign control of the dyes and chemicals we need in processing our textiles. It was a very forceful way to show the textile men how closely tariff protection for dyes is related to their business interests. His words cast light upon the reason why our dye manufacturers are making such an effort to secure adequate protection on the faster types of dyes.

Ten years ago the struggle was waged and won for protection for an "infant dye industry." But no longer can the same arguments be applied to the issue of to-day. As a dye producer the United States has advanced to an enviable position in the world's trade. It has been supplying American mills with most of the colors they use—with 96 per cent of their needs, calculated on the basis of poundage consumed. But in the last few years a great change has been wrought in the dyeing industry. With the demand for faster fabrics there has begun a steady swing away from the cheaper bulk colors which have comprised most of a mill's dyestuff needs. The public demand for faster merchandise has been passed on to the American dye industry in an appeal from the textile mills for faster colors.

This has meant extensive laboratory research and the development of many new types of colors. The range of fast dyes made in the United States is not complete and in many cases the consumption of certain colors is not yet large enough to repay the industry for its work in developing them. In the face of this condition the prices on many colors cannot be reduced until heavier production is called for. Meanwhile, the competition from the foreign dyes has steadily increased in these faster, more expensive types. The dye import tables show this trend plainly from month to month, from year to year.

As Dr. Killheffer told the textile chemists of the Piedmont Section, the fast dyes "are considerably more expensive to manufacture and very much more complex, which means multiple labor costs throughout; and whereas a seven-cent specific duty is considerable on a dye selling for only 16 cents, it is nothing at all on a dye selling for $2 or $3.

The situation from this aspect becomes very clear. The American dye manufacturers have been called upon by the mills for faster colors in a wide range of shades. They have therefore been concentrating their research efforts upon the development of these types and their progress has been exceptionally rapid, as all consumers of American vat colors will readily admit. But the competition from imported fast colors has paralleled our industry's advances. All the endeavors of the dye industry to develop new colors and to reduce prices on their present range of fast dyes have been hindered by an increasing foreign competition.

Last week the Government issued its monthly figures on dyestuff imports. They disclosed that for the first six months of this year more than three million pounds of foreign dyes have been imported, a total considerably larger than for the same period last year. The imports for 1928 were 27 per cent higher than for the previous year, and at the present time they form about 20 per cent of our consumption by value. The bulk of these imports has been distributed among the fastest types of colors, or in precisely those dyestuffs most in demand to-day.

Only by adequate protection can America's development of the fast colors be continued. The dye industry is not fighting for any higher rates of duty in the Hawley-Smoot tariff now before the Senate. But it has sought to make clear to the men in Washington who are making the new tariff that the industry cannot possibly do with less than is provided in the Hawley-Smoot bill.

In this bill the very essence of the necessary protection on dyes is the basis of valuation on which the rates in Paragraphs 27 and 28 are assessed. That basis, as explained before in these pages, is the American selling price of the domestic colors, in the case of competitive foreign dyes. Opposition to this American valuation plan has naturally been strong in the ranks of the importers. In submitting their case first to the House Ways and Means Committee and later to the Senate Finance Committee at the hearings on the chemical schedule of the tariff, they have devoted lengthy briefs to arguments which try to prove the impracticability of American valuation. They have contended that it constitutes an em-

bargo on imports under Paragraphs 27 and 28. They have constantly asserted that the American selling price valuation causes delays in the entry and assessment of imports and that it has been impossible to determine whether or not dyes are competitive or non-competitive at the time of entry.

Now, the evidence submitted by the Synthetic Organic Chemical Manufacturers' Association has refuted these arguments at every point. The record of increasing imports during the past five years, while the American valuation plan has been in operation on the dye paragraphs, should certainly be sufficient to prove that nothing like an embargo is in force. Practically all the difficulties and delays caused by the American valuation plan during the first year or so of the 1922 tariff, furthermore, have been overcome, and witnesses have repeatedly testified before the House and the Senate to the efficiency of this plan.

American valuation also automatically decreases the amount of duty to be paid as the domestic industry develops and reduces its domestic prices. As Dr. Killheffer told the Senate Committee, this is a most desirable condition from the importer's viewpoint.

If we may quote from the latest brief filed with the Senate by the dye manufacturers: "'The outstanding tariff problem in the dye industry is to afford adequate protection for the fast or high-priced types because of the rapid world-wide trend toward these colors. The industry of the future will be largely concerned with this class of dyestuffs, in the development of which to date it has made a remarkable record of achievement." Experience and the opinion of tariff authorities have upheld the American valuation plan as the most efficient basis for the kind of protection our industry wishes to retain in the new tariff.

ARTHUR D. LITTLE SPEAKS IN LONDON

Scientific discoveries make many opportunities for employment, Arthur D. Little told the members of the Society of Chemical Industry at Manchester, England, July 9, during the course of his presidential address on the subject of "Science and Labor." These opportunities, said Dr. Little, tend to offset labor displacements caused by improved manufacturing processes or new inventions.

Dr. Little is president of Arthur D. Little, Inc., of Cambridge, Mass., chemists and engineers. During his stay in London he will receive the honorary degree of doctor of science from the University of Manchester and honorary associateship in the Manchester College of Technology.

The results of invention and discovery made by Government employees are and should be public property. No legislation can change the moral right of all industries alike to profit from valuable discoveries made by the Government or its staff.—*Chemical & Metallurgical Engineering.*

DYE IMPORTS 3,000,000 POUNDS FOR FIRST HALF OF YEAR

Higher in Value and Poundage Than for 1928

FIGURES were issued last week by the United States Tariff Commission on the importation of coal-tar dyes during the month of June. These statistics disclosed the fact that for the first six months of this year 3,267,478 pounds of foreign dyes have been imported, with an invoice value of $2,627,558, an increase in both value and quantity over imports for the same period of 1928.

The detailed figures on June imports are published below:

Imports of Synthetic Dyes

	1929		1928	
	Pounds	Invoice Value	Pounds	Invoice Value
January	552,821	$432,505	415,156	$327,148
February ..	390,664	323,514	478,407	391,351
March	766,786	612,253	378,191	316,183
April	576,193	445,200	633,815	505,152
May	523,817	428,780	382,233	295,969
June	457,197	385,306	411,662	309,607
Total 6 mo..	3,267,478	$2,627,558	2,699,464	$2,145,410

Per Cent of Dyes by Country of Shipment

	June, 1929	June, 1928	Jan.-June, 1929	Jan.-June, 1928
Germany	66.0	63.4	71.05	64.21
Switzerland ...	28.0	25.9	24.15	23.98
France	1.0	1.2	1.12	1.71
England	2.0	3.0	1.42	2.26
Belgium	1.0	2.5	0.72	2.96
Canada	1.0	2.0	0.98	2.29
Italy	1.0	1.4	0.32	1.93
Netherlands		0.6	0.24	0.66

Dye Imports by Ports—June, 1929

	Pounds	Inv. Val.
New York	446,977	$372,945
Boston	9,402	11,445
Chicago	500	200
Philadelphia	318	716
Total	457,197	$385,306

Leading Dyes, by Quantity, Imported During June, 1929

	Pounds
Vat Golden Yellow GK Double Paste for Printing (s.s.)	34,000
Anthra Yellow GC Double Paste (s.s.).....	22,946
Algol Orange RF Paste for Printing.....	19,500
Rhodamine 6GH Extra (s.s.).....	10,000
Vat Yellow G Double Paste (s.s.).....	9,990

AGING IN THE PRINT WORKS

(*Continued from page 488*)

heat of vaporization," and upon condensation of the steam this amount of heat is given back again to the surface in contact with the condensate.

It would be well at this juncture to take up a few points regarding heat transfer. It will be remembered that heat can be transferred in three ways: first, conduction; second, convection, and, third, radiation. Convection is what has to be dealt with mostly in studying heat flow with gases at moderate temperatures. It is generally quite a rapid process, but it is limited in its speed by a conduction process somewhere along the line which is usually comparatively slow. In the simple case of heat conduction through a metal, the quantity of heat transferred is proportional to the temperature difference, to the area through which it is passing, and to the time, and is inversely proportional to the length of section. It is also proportional to the coefficient of heat transfer of the material in question, which may be small or large.

It is in the cases of heat flow from a solid to a liquid or from a solid or liquid to a gas that the most serious limitations of heat flow by conduction take place. Liquids and gases are poor conductors of heat generally, and at the surfaces of contact between the solid and the liquid or gas there is always a film of this liquid or gas through which the heat must be forced. Anything that will disrupt this film and make it smaller will greatly speed up the heat transfer. In the case of boiling liquids or condensing gases a condition exists which minimizes this film thickness, and consequently a greatly increased heat flow results. Considering these facts about latent heat and heat transfer, it can be seen why temperature control in an ager with steam at or near the condensation point might be a difficult matter on account of the large quantities of heat which can be moved quickly.

Hygroscopic Materials

It might be well at this point to consider briefly the matter of hygroscopic materials, or those substances that readily absorb and retain moisture. Cotton and wool are hygroscopic, and so are many of the other materials such as starch, British gum, glycerine, caustic soda and potassium carbonate, which are common ingredients in color printing pastes. These materials, the temperature and humidity of the room, and the length of time the cloth is in contact with the air will affect the amount of moisture which the cloth will carry into the ager, and this can conceivably be a real factor.

Conditions Within the Ager

In regard to what actually takes place within an ager, one thing which is almost common knowledge is that as the aging operation goes on, for a time at least, the temperature rises, sometimes tremendously. There is evidently an exothermic reaction going on there. It is interesting in this connection to recall here some of Dr. Reinking's[2] observations. Reinking described a visit to a Silesian print works and mentions an ager in which they were having trouble with their vat colors in the heavy shades. In the course of the run there was a gradual falling off in shade, and it became lighter in the middle than on the edges. He stated that the temperature changed from 214 to 237° F. Their ager, he said, was of the latest design, in which the steam was moistened before it entered; but he mentions also that the steam supply was small, which, to anticipate matters a little, was probably a large cause of the trouble.

He speaks of a visit to another plant where they were making yellow discharges with Auramine. In this ager, supposed to be a model one, while the temperatures at the side showed a little over 212° F., the results clearly showed that in the middle portion of the ager the temperature was much higher.

At his request, Reinking continues, the manager of the plant gave instructions to bore a hole in the side of the ager so that a long thermometer could be introduced to reach into the middle of the machine. So long as the apparatus was used for steaming basic colors, or as long as unprinted goods ran through, there was no change in temperature. The short thermometer at the side and the long thermometer reaching to the middle indicated the same temperature; but as soon as the goods padded or printed with Aniline Black, or goods printed with Rongalite, were run through, whether or not it was for direct or discharge work, the situation changed. While the short thermometer showed almost no change in temperature, and then rose only a few degrees in the course of several hours, the thermometer in the middle went up rapidly. In the case of Prudhomme's Aniline Black there was a difference in the readings of the two thermometers of 36° F. within a short time. With heavy Rongalite designs the differences were similar, though not quite as much; but even with the lightest designs there was a considerable difference in temperature between the two thermometers.

Reinking mentions is his lecture that one of the reasons this overheating was not noticed for a long time was that the cloth was not tendered, contrary to the case of Aniline Black, where, if there is any appreciable overheating in the presence of the oxidizing agents printed on the cloth, the tendering serves as a ready tell-tale of what has happened.

It is self-evident from those remarks that there was a zone in that ager where apparently more happened than anywhere else, or at least the heat of the reaction could not in those places be so readily dissipated as in other parts of the ager.

Course of the Cloth in the Ager

With the foregoing remarks as a guide, the course of the cloth and the path of the steam through an ager will be traced in order to visualize what happens.

As the cloth enters the machine the relatively cold cloth comes in contact with the steam and is warmed up by it. At the same time the steam must be cooled down somewhat. If it is superheated, or if there is a plentiful supply of it, there may not be any condensation of water on the cloth, but there is a chance that this might happen. Anyway, there must be, due to the hygroscopic nature of the cloth and materials on it, some exchange of moisture between it and the steam—either absorption or evaporation—probably more absorption at the start. This water must be in the cloth to dissolve the materials present, at least partially, in order that any reaction can start.

The somewhat dry thickening becomes softened, allowing the dissolved dyestuffs and chemicals to penetrate into the cloth and locally dye it. With the application of heat the reaction speeds up and heat is evolved at a faster rate, if the reaction is exothermic. Unless this heat is removed in some way, the temperature of the cloth will build up even beyond the steam temperature. If it goes too high the reaction will tend to subside due to the drying up by evaporation of the materials on the fiber, but before that point is reached considerable over-action and damage to perhaps both fiber and color may result.

The flow of the steam will now be considered. The steam can obviously be introduced in many ways into the ager and practice varies in this regard. Anyway, it is shot downward near the bottom in most agers and is deflected upward. As the steam rises it passes up through the cloth to a certain extent and around the sides of the cloth. It is also pulled from the back of the ager towards the front by the fan. In going forward it is again directed downward to pass through the aperture at the front unless this aperture, as it is on some agers, is at the top of the machine. Now, the steam that rises up into the cloth encounters more resistance to its passage and must be, therefore, more or less held back. In other words, the steam passes around the cloth more easily than up through it. Also, the motion of the cloth, one side up and the other down, especially when it is traveling fast as in Aniline Black aging, tends to give the steam a whirling motion and to create a series of eddy currents within the cloth.

If a picture could be taken of all these motions of the steam it would be undoubtedly a complicated one, but certainly it can be seen that there is a great opportunity for the creation of pockets of stagnant or dead steam.

It is an interesting speculation just where the most valuable work is done. Probably there are certain places in which the reaction is more favorably influenced than others, and the problem naturally develops into making this useful zone as large as possible if the greatest efficiency is to be obtained. Unless there are other means of heat removal, the only way it can get out is with the exhaust gases and steam. The cloth also comes out hot and carries away a certain amount of heat, but not until after the damage is done to it if the temperature has risen excessively.

The steam, then, really has two opposite functions: first, as a supplier of heat, and second, as a heat remover by sweeping out the stagnant, overheated gases.

The general condition of the steam within an ager has been conceded by most observers to be superheated no matter how it may be before it enters. It is, also, very slightly higher in pressure than the outside atmosphere. If the steam were not superheated to some degree, at least in the neighborhood of the cloth, it is difficult to see how water drops could be avoided and the expression "moisture within an ager" is somewhat misleading. If there is any real moisture there it must be in or near the bottom of the ager and not up around the cloth.

Saturated steam, if the moisture content is not too large, will superheat just in passing from a vessel at higher pressure to one at lower pressure, if no work is done, and the vessels are well insulated. Consequently, even with no heat from chemical reactions or from other causes being developed, the steam in an ager will be usually slightly superheated.

Aging Troubles

Turning now to the actual troubles incurred in aging due to the cloth, steam, and mechanical conditions, the most important of them can be summarized as follows:

1. Grease spots on the cloth caused principally by putting too much grease into the stuffing boxes of the rollers.

2. Starting up the ager before it is sufficiently heated, and the steam temperature too low, causing condensation of the steam and the running or blurring of the colors.

3. Ager running too fast. This causes light shades and is also likely to cause poor whites because of insufficient development and fixation of the color and its subsequent washing out in the soaping operation.

4. Stopping of the machine due to various causes, and the ager running too slow. This generally causes light or dull shades by "over-reduction" if it happens to be a vat or other color applied with Rongalite.

5. Steam temperature too high. This, like the previous item, causes light and dull shades by over-reduction.

6. Variations in shade due to uneven steam pressure and quality of the steam. This is quite likely to occur when there are a number of departments drawing off steam from the line supplying the ager.

7. The next trouble is in a way sort of imaginary because it is not supposed to exist at all, and that is the presence of air in an ager when reduction reactions, as with Rongalite, are taking place. Just how much of a trouble this is has not been very thoroughly described in the literature. Hannay, to whose lecture reference has already been made, brought out in the discussion follow-

ing his lecture that in attempts to draw out steam from an ager while it was running almost invariably led to disaster with the goods that were going through. As the risk of this air access, judging by his statements, had been very thoroughly guarded against, it can be concluded that the amount of air seepage that will cause trouble must be exceedingly small.

8. The next trouble might seem rather indefinite and theoretical, but it is probably more real than is commonly thought, and that is the variations in the nature and conditions of the entering cloth. A more open construction of cloth would give the steam more chance to act on the color than a closed one, and the effects could be either beneficial or detrimental depending on other conditions. Also, there is the moisture content of the cloth, which, as mentioned before, will be affected by the length of time it has been allowed to lie in the room before aging, and upon the temperature and humidity of the room.

Also, especially with cloth carrying Rongalite, long contact with the air can oxidize to some degree the Rongalite and partially reduced color and thereby cause some unevenness and poorer development of shade

Proper Study and Control of an Ager

The next question is how can the aging operation be studied and controlled to avoid these troubles and to secure the best results? This question is already answered to some degree by the foregoing, but some things should be re-emphasized and the factors gone into further.

Starting with a given color recipe as a fixed condition, the temperature would seem to be the most important factor. It is important because it so greatly affects the action of the chemicals and sheds light on so many other things. If the temperature within an ager and the barometric pressure of the outside air are read off, the superheat can be obtained by referring to the steam tables. Driessen[3] recommends this as a means of control by plotting curves of these measurements.

If the temperatures are taken at different points in the ager it sheds light on the actual heat distribution and circulation of the steam. Excessive temperature differences certainly indicate poor circulation and insufficient steam supply.

The temperatures recommended for the several classes of work have already been given, and the matter of excessive steam temperature was mentioned in the section on "troubles." With some colors and some classes of work the excess heat causes more trouble than with others. Reinking mentioned in his lecture the matter of discharge whites with Leucotrope on Indigo. He stated that the Indigo is reduced in spite of the superheating and probably even destroyed, but there is no complete benzylation of it and, consequently, the prints obtained are sensative to air and are of poorer quality. With the indigoid type of vat color disastrous results can be caused by partial destruction of the color. With the anthraquinone type, which unlike the indigoid, has more than one degree of reduction, the over-reduction caused by the overheating permanently changes the shade to one markedly different from its normal one.

The next factor of importance is that of time. For each pattern, cloth, color recipe, color, steam condition and ager design there is an optimum aging time and this will have to be determined by trial. One point which might be mentioned in connection with this factor is the danger of wetting the goods and "springing" the colors if the steam entering into the cloth is too near the saturation point and the goods are allowed to stay in the ager under this condition too long.

There is a question, which might be the best to vary—the time or the flow of steam for a given pattern. As a rule, it is thought that the time should be varied and the steam conditions let alone, but there are cases where undoubtedly the supply of steam should be changed as well as the time.

The matter of steam supply was the next point. No thorough study of an ager can be made without an investigation of the amount of steam it uses, and it might be well to have a flow meter attached to each machine to measure this from time to time or to have as a means of regular control.

Reinking and Driessen[4] point out that the fixation of vat dyes depends greatly on the steam supply. The indigoid dyestuffs, he found, were not as sensitive in this respect as the anthraquinone colors.

Regarding the other steam conditions, the pressure and moisture content of the entering steam are important, and should be kept as constant as possible. The pressure is watched, probably, in every plant, but the moisture content has not been so generally observed; in fact, there seems to be a general indisposition to look into this important factor. This moisture may range from 2 to 3% to around 10% or over, and it will be evaporated, cooling the steam in contact with it, when it expands into the ager. It could conceivably lower the temperature inside to a serious degree, if excessive.

Moisture determinations are made with what are called separating and throttling calorimeters. Guiterman[5] describes some experiments he made with a separating calorimeter. Moistures have been readily obtained in steam which is at a substantial pressure such as exists in the line feeding to the ager, but so far as the writer has been able to find out there has been no suitable means of determining moistures within the ager. In this connection, however, since the steam in contact with the goods is superheated and not moist, this matter need cause no great concern unless the steam at other points not in contact with the cloth is to be tested. It has been proposed by some to employ a wet and dry bulb thermometer or psychrometer to determine these moistures, but such an instrument would not work with saturated steam where the dry and wet bulb temperatures and dew

point are the same. This sort of instrument conceivably could be used, however, to measure the superheat.

Not only are the live steam conditions to be controlled but the pressures, and therefore the temperatures are also to be watched in the top plates and other steam coils. If these are too low, condensation of steam within the ager can result, or if too high, local, excessive superheating of the inside steam can occur.

New Devices and General Recommendations

Where sharp differences in temperature are so apt to arise as they are in an ager, it would surely seem as if some good means, automatic if possible, should be devised for cooling the steam inside. The recent Jacoby and Chapin process[6] does this by introducing water into the ager through blankets hung down between the rollers in the reaction zone. In this case the latent heat of vaporization of the hot water serves as the automatic cooling agent. Another object of this process, it is understood, is to cut down the time of aging.

Considering the matter of automatic regulation of the steam supply to the ager by the temperature inside, it is difficult to see how this could be possible as there are cases, as in vat colors in heavy shades, where a decreased temperature can result by increasing the steam supply, and there are other cases where increasing the steam supply could increase the temperature. One cannot always tell just how this thing is going to work out. It is due to this function already mentioned, of the steam as a supplier and remover of heat.

There are various moistening devices and schemes in use to condition the steam before it enters the ager in order to preserve the ideal of near the saturated state of the steam inside. Sometimes this is accomplished by the simple expedient of mixing high and low pressure steam or taking advantage of the exhaust steam from engines if they are near by. Atomization of water into the steam by a suitable means is the principle usually employed in the devices on the market. A boiling water bath in the base of an ager is a way advocated by some of keeping the steam in proper condition, which it is understood has been very successful when the other conditions have been right. One authority has gone so far as to advocate removal of the insulation from the outside of the ager so that some of the steam will condense and run down the sides, thereby removing some of the superheat. In all these methods, however, one must be careful to avoid water drops on the goods.

Another measure advocated and practised by some to improve the aging is a direct steam line from the boiler to maintain more constant steam conditions. The necessity of this, it is thought, would be a matter that could only be determined by a study of the actual fluctuations in any one plant and just how much variation in shade is caused by these fluctuations.

Getting back again to the matter of steam and temperature control within the ager, it would seem as if there was much to learn if a thoroughly scientific solution of the problem was to be obtained, especially as far as automatic regulation from the inside is concerned. Taking it all in all, it is not certain that any more practical means has yet been devised than that long ago used by Schlieper and Baum and strongly advocated by Reinking in his lectures, and that is simply to have a copious supply of saturated steam to the ager. Reinking claimed that by such simple means the usual aging time could be cut down one-fourth.

Taking the problem as a whole, however, and considering the variations in each plant from the color recipes used to the actual aging, it is not simple and is one that is worthy of a great deal of study by engineers and physical chemists. There cannot be any suitable substitute for a thorough study of every condition from the making of the color to the actual state of things inside the ager. Good technical control should be developed and established all along the line. By such a method of going at the problem with the necessary full co-operation of those engaged in and familiar with the work, much in the way of valuable results for all concerned could be obtained.

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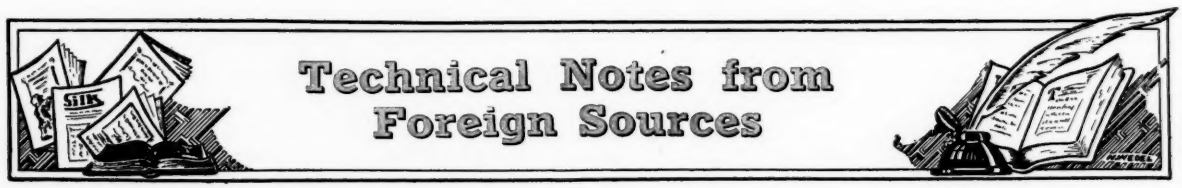
MAY COMPANY ACQUIRED BY CALCO

The Calco Chemical Company, of Bound Brook, N. J., large factor in the dyestuff industry, announced last week that it had acquired the plant and goodwill of the May Chemical Works, of Newark, N. J., and will continue the production of the dyes in which this plant has been specializing—namely, Red for Lake C, Permaton Orange and Permaton Red.

The announcement further explained that the operation of the plant will be continued under Dr. May's direction, and the same standardization of the finished products will be maintained. Orders and inquiries for products of the May Works, it was stated, should hereafter be addressed to the offices of the Calco Chemical Works at Bound Brook.

The Dyestuffs Department of E. I. du Pont de Nemours & Co. states that it is planning to put on the market a line of sulphur colors with the copper content so controlled that customers will be able to use them successfully for various coated textile fabrics.

They have already put on the market Sulfogene Carbon H Conc. CF and Sulfogene Fast Green BCF.



Colloresin D Dry and Its Use in Printing

E. Pfeffer u. Dr. Gmelin; Mell. Textil-Ber. 9, 666 (1928).—Since the work of Cross and Bevan upon cellulose and cellulose derivatives, general interest, especially in the textile industry, has been directed in increasing degree to the technical evaluation of cellulose, the substance occuring so abundantly in the vegetable kingdom. While first of all it was the esters of cellulose with mineral or organic acids which, as well as the cellulose regenerated from their solutions, were first drawn upon for the production of artificial fibers, with more or less success, still the ethers of cellulose, especially the ethers of it with the lower alkyl radicals of the aliphatic series, have offered possibilities of technical application in quite another direction; and this, as a result of their unique physical properties. To this latter group of cellulose derivatives belongs a product which, a year ago, was brought into commerce by the I. G. under the name of Colloresin D, and most recently as Colloresin D Dry.

This latter substance, though chemically much modified, still bears the fibrous character of the source material, and forms a dry, almost colorless, cotton-batting-like solid, which, when covered with water of 40° to 50° C., becomes wetted through, on good stirring swells, and finally on standing and cooling, goes into solution, forming a thick, transparent paste. Technically valuable pastes are obtained thus by solution of 75 g. of the Colloresin D Dry in 925 c.c. of water. To obtain solution more rapidly, one can use, with advantage, a solution of 1½ g. of Nekal BX dry per liter of water, in place of warm water alone, and the solution can then be used directly, cold. Such a solution of 75 g.-925 c.c. possesses the consistency of a thickening paste suitable for printing. It can be mixed with water and diluted as desired. With the addition of boiling water it coagulates, but goes back into solution again on cooling. Normal or basic salts, as well as fixed alkalies, and especially alkali carbonates, at a high concentration, bring about coagulation, while organic acids, such as acetic or formic acids, or solvents such as Glyecine A, glycerol, or acetine, the alcohols, etc., influence favorably the solubility of the paste. Tanning agents precipitate the paste and therefore cannot be used in conjunction with it.

With these properties, Colloresin D Dry can be used as a thickener in cotton printing, and for this purpose offers certain advantages over the generally used thickening agents, such as starch, meal, tragacanth, and gums. These advantages depend principally upon the ease with which the substance will wash out with cold water, so that the goods become soft and pliable again after the washing. This property is of especial value in the case of wool and of silk printing. When printing with mordant dyestuffs, a Colloresin thickening is of especial advantage, since it does not form difficultly soluble compounds with chromium salts, as do gum and starch thickeners, so that after washing the goods are soft and pliable. It is also true that in the printing of insoluble azo colors the diazo printing pastes possess better stability in a Colloresin thickening. Such pastes are not liable to the formation of mould, and in capability of exhaustion are superior to an average grade of tragacanth by about 10%. In a comparison of costs it should be remembered that with Colloresin the boiling for several hours, required with a tragacanth thickener, is not necessary.

The above seems to be of general interest. The rest of the paper discusses in detail the methods of printing, and includes four specimen swatches printed according to detailed recipes given in the paper.

Solubilizing of Vat Dyestuffs

British Patent No. 260,303 (*addition to British Patent No.* 186,057); *Durand and Huguenin, Basle.*—Vat dyestuffs are converted to water soluble esters of their leuco-compounds by the action of pyro-sulphuryl chloride upon the leuco-compounds in question, in the presence of tertiary bases, such as dimethylaniline, and of inert solvents or diluting agents.

Dyeing with Vat Dyestuffs

British Patent No. 280,983; *J. Swor, M. Jones and Wm. Kilby.*—The goods are padded with a solution of a water soluble ester salt of the leuco-compound of a vat dyestuff (of above, British Patent No. 186,057), steamed, and developed. An oxidizing agent may be added to the bath, provided it is of such a nature as to remain inactive till brought into action. Such an oxidizing agent is sodium nitrite, which on treatment of the steamed goods with a 1% sulphuric acid bath develops the dyeing. Goods are as usual afterward rinsed and soaped.

Dyeing of Animal Fibers with Ice Colors

British patent No. 283,347; *A. E. Everest and J. A. Wallwork.*—The padding bath, of alpha or beta naphthol, is prepared with the use of soap, in order to diminish or avoid entirely the need of free caustic alkali. After padding, the goods are developed as usual with a diazotized or tetrazotized amine.

Dyeing of Wool with Ice Colors

British Patent No. 283,838; *A. E. Everest and J. A. Wallwork* (*See British Patent No.* 283,839).—As wool is padded with a Naphthol AS series base, prepared in weak alkaline solution with the addition of soap or some such dispersive agent. The point of the patent lies in the avoidance of much free caustic alkali.

Dyeing of Natural Silk with Ice Colors

British Patent No. 283,839; *A. E. Everest and J. A. Wallwork.*—This patent relates to the use of the Naphthol AS series upon natural silk. The material is padded with the Naphthol AS base prepared with soap solution instead of with caustic alkali.

Use of Ultra-Violet Light in Textile-Chemical Investigations

Dr. H. Sommer; Mell.Textil-Ber. 9, 753 (1928).—The author comments at length upon the difficulties encountered, as well as advantages enjoyed, in the use of the ultra-violet lamp in the laboratory, as a means of distinction between different samples of textile goods of various kinds, sources, and grades. He acknowledges generously the value of work already done and published in this field, particularly the quite recent results of Dr. Nopitsch, but cannot altogether agree with N.'s estimate of the value of U.V. light in several cases. For example, he finds that a satisfactory distinction of various brands of cotton according to their origin is not possible: raw Egyptian cotton (Mako) does usually display a brownish luminescence, while raw American cotton mostly shows a yellowish-white one; but in each case transitional stages to the characteristics of the other brand occur; and the same uncertainty is manifested in the comparison of other pairs of brands. The same is true of the comparison of unbleached flax and hemp; the author finds raw flax to display a somewhat coffee-brown, and raw hemp a sand-gray, luminescence, while Nopitsch ascribes to each a more or less yellowish-gray. Bleached cotton, too, can be distinguished from bleached flax only through microscopic examination (if coining hitherto non-existent needed words, even in a philologically correct way, were not heretical, we might have translated the text at this point as "through microscoping"). The white, hairy materials of animal origin, such as mohair, alpaca, etc., appear under the ultra-violet lamp as identical with wool: again, only the microscope can decide which is which.

In the case of other questions which arise, the ultra-violet lamp may prove to be of great value; this is true, at least, of certain undyed materials. Thus, wool damaged by alkali shows a duller and more yellowish luminescence than does undamaged wool. But a plain distinction can be drawn only when the wool has been damaged to an extent corresponding to a loss of 20 to 30% in tensile strength. Overcarbonized wool, or cellulose which has been overbleached (oxycellulose) or damaged by acids (hydrocellulose), show little detectible alteration under the lamp. But material damaged by exposure to light does show a marked alteration in the ultra-violet ray; the intense luminescence characteristic of the undamaged fiber becomes dull and gray.

The author makes a valuable suggestion which quite possibly is already being acted upon in some quarters. "We stand," he says, "merely at the threshold as far as our experience in this field is concerned. It is conceivable, for example, that with another source of light, which yields in the ultra-violet region not merely a line spectrum, as is the case with the mercury-vapor ero, but also a more continuous spectrum, could provide a much more many-sided series of luminescence phenomena; it might be possible then, by the use of suitable filters for limited regions of the spectrum, to arrive at finer distinctions in luminescence than are now possible."

The author closes with the warning that the results of ultra-violet examination of textile material must not be overvalued at present; that its use should be restricted to a rather small group of problems, and that even then its results should be verified by other means of investigation already known.

Dyeing and Printing with Vat Dyestuffs

German Patent No. 431,250; *Durand and Muguenin, Basle* (*addition to German Patent No.* 418,487).—The patent relates to the recently much-studied products of reaction of leuco-vat dyestuffs with chlorsulphonic acid, in the presence of such potential alkalies (for neutralization and rendering harmless of the HCl liberated) as dimethylaniline or other tertiary bases. The material to be dyed is padded with a solution of such a product, containing also an oxidizing agent of a kind which cannot exert its oxidative action until the reaction of the mixture is rendered acid; for example, chromates and nitrites, particularly sodium nitrite. The padded material is dried, then developed by passage through an acid bath. Further, the goods may be printed, before development, with a preparation containing hydrosulphite, sulphite, thiosulphate, etc., which will counteract the oxidative action of the oxidizing agent, when the padded goods are passed into the acid bath. Such areas will, of course, remain undyed.

If the milder reducing agents just mentioned (sulphite or thiosulphate) be used in place of the energetic hydrosulphite, it will be possible to print the padded goods with a paste containing, beside the sulphite or thiosulphate, certain basic and mordant dyestuffs, dyestuffs which can be fixed with albumin, dyestuffs of the nature of Nitrosamine Red (if thiosulphate is used), or dyestuffs generally which can be properly fixed, and which will withstand the action of the reducing agent which is used.

Use of Vat Dyestuffs on Animal Fibers

German Patent No. 431,501 (*addition to German Patent No.* 418,250); *Durand and Huguenin, Basle.*—See the preceding (German Patent No. 431,250). The new dyestuffs obtained by reaction of the leuco-compounds of vat dyestuffs with chlorsulphonic acid in the presence of a tertiary base do not usually show any affinity for materials to be dyed. But at an elevated temperature they do display affinity for animal fibers, especially in the presence of acids. Even absorption is favored by employing organic acids or mineral-acid sales of acid nature, such as sodium bisulphate, at the beginning of the padding, and shifting to a mineral-acid reaction toward the end. The process is successful with wool; the color is developed with an oxidizing agent after padding; sodium bichromate, sodium nitrite, ferric chloride, hydrogen peroxide, etc., may be used.

Keeping of Vat Dyestuffs in Paste Form

German Patent No. 433,413; *I. G. Farbenindustrie, A.-G.*—By addition of a small amount of a permanganate to the paste, the settling out into a viscous, almost tough cake of the solid component of many dyestuffs in paste form can be prevented. One example cites the addition of a concentrated solution of 0.25 parts of potassium permanganate to 500 parts of a 10% paste of the dyestuff.

GENERAL DYESTUFF ANNOUNCES NEW COLORS

A leaflet has just been presented to the trade by the General Dyestuff Corporation as the sole distributors of the dyestuffs manufactured by the General Aniline Works, which offers Indanthren Brown GA. This, it is claimed, corresponds in all fastness and dyeing properties with the well-known imported brand "G." It is mentioned that this brand is not quite as reddish in shade as Indanthren Brown RA, but is of the same excellent fastness to light, washing and chlorine. It is further claimed that it is level dyeing, and is a very good product for combination shades. Mention is also made of the fact that it possesses a very good affinity for silk.

The above company has also issued a four-page circular with swatches describing a new straight product of the Palatine fast color, known as Palatine Fast Dark Green BNOO, for which the claim is made that it produces a full dark green shade of very good fastness to light, washing, decatizing, carbonizing, alkali and perspiration, which makes the new brand a very useful product in the dyeing of men's wear and the better grade of ladies' dress goods. It is especially recommended of yarn and piece goods, but may also be used for raw stock if the material does not have to stand too strong a fulling. It is further claimed that this color possesses a very good fastness to water and salt water, and is, therefore, very suitable for dyeing of knit goods, such as sweaters, bathing suits, etc., as well as for dyeing of woolen and fur hats on account of its good penetrating and level dyeing qualities.

New Cellit Dyes

Another circular has also been issued by the same company consisting of two descriptive pages with swatches on their product Cellit Brown R. The leaflet mentions the fact that this is a new homogeneous water-soluble dyestuff for the dyeing and printing of acetate silk; mention also being made of the fact that it possesses good fastness properties and fills a want in the range of acetate silk dyestuffs.

It is claimed that this dyestuff levels very well and yields fine yellowish-brown shades. It may, particularly for pale shades, be used by itself and in combination with cellit fast colors for the production of mode shades. The dyeings are of very good fastness to water and washing, as well as to good fastness to rubbing, hot pressing, scruping and acid; the fastness to light is fairly good; the dyestuff stains cotton but little and is therefore suitable for effects in mixed fabrics of acetate silk and cotton; on the other hand, it is not recommended for effects in mixed fabrics containing wool and silk as it stains animal fiber stronger. It is recommended as being useful for print-on styles on acetate silk, the prints being of good fastness to water and sublimating. It is unsuitable for discharge purposes.

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